

231

Railway Mechanical Engineer

June
1945

SAVE truck EXPENSE!

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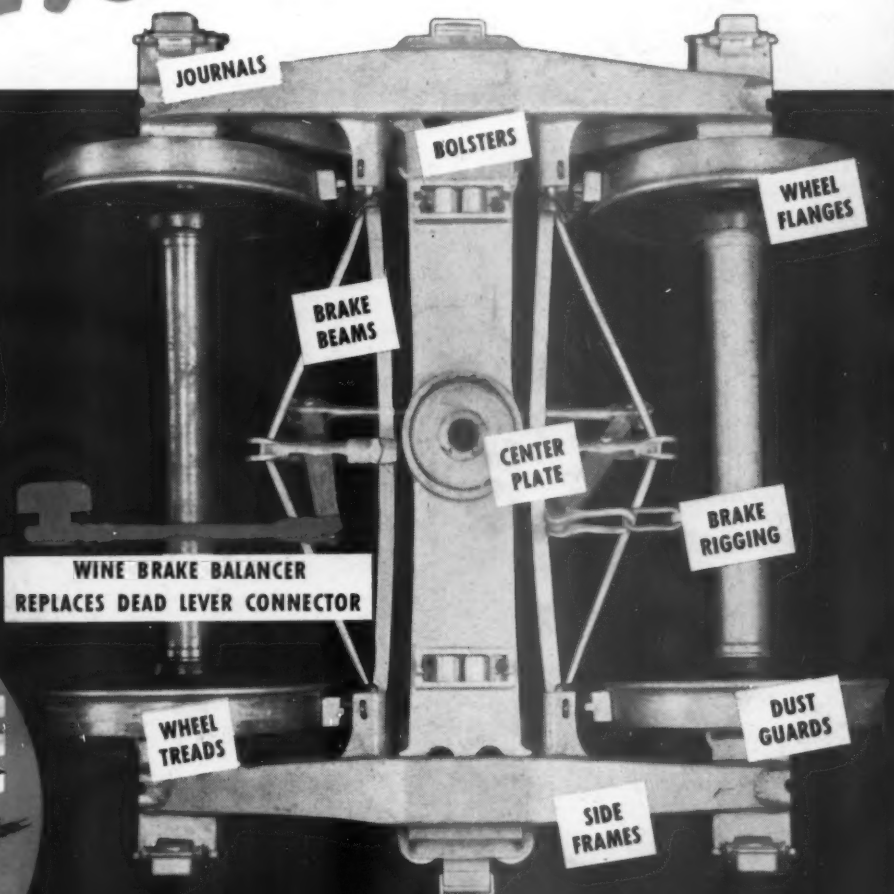
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COPY

GIFT

REDUCE WEAR
AT ALL FRICTION
POINTS ➡

Specify
WINE



BRAKE BALANCER



THE WINE RAILWAY APPLIANCE CO.,

TOLEDO 9, OHIO

UNIT TRUCK



PERFECTLY SIMPLE
SIMPLY *PERFECT*

UNIT TRUCK CORPORATION

140 CEDAR STREET

NEW YORK, 6, N. Y.

Published monthly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second-class matter, April 3, 1933, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription price, \$3.00 for one year, U. S. and Canada. Single copies, 35 cents. Vol. 119, No. 6.



OAKITE
"ON TIME"
COACH
WASHING
Saves Money!

To-Day's BEST Answer to

Fast . . . Low-Cost Coach Washing!

Oakite Compound No. 88

KEEP POWER ROLLING

**To Superintendents and
 General Foremen of
 All Car Departments**

Oakite Compound No. 88 is a powdered material acidic in nature, specially designed for light, medium and heavy-duty coach washing. You simply apply it to surfaces, permit to soak, then fountain brush to rinse. It has no harmful effect on colors, lettering on painted surfaces. Greatly improved coach appearance results wherever it has been used. Price and Special Service Report giving details free on request.

THIS NEW Oakite coach washing material gives you remarkably fast cleaning action . . . is **SAFE** to painted or lacquered surfaces and does not change colors . . . quickly removes carbon deposits around rivet heads . . . rinses easily . . . leaves no white deposits or streaks on sash or side of coaches.

In addition to these desirable advantages, you will find Oakite Compound No. 88 easy to apply . . . a big time-saver wherever car washing is to be done quickly. You will like, too, the clean, glossy surface it produces and equally important, its economy. It is today's best answer for low-cost car washing. Details on request. Arrange for a test on your terminal washing. Inquiries invited and promptly answered.

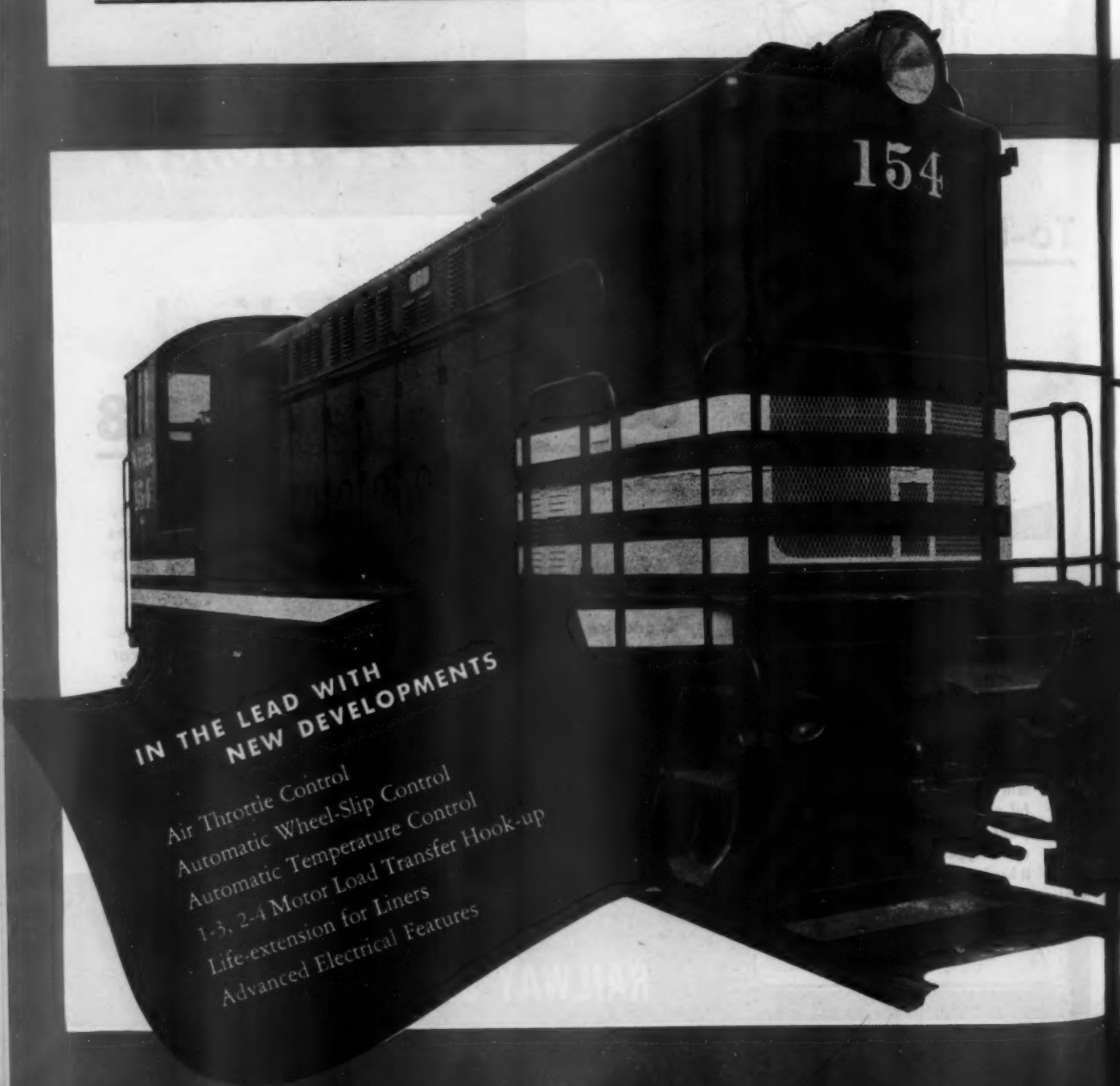
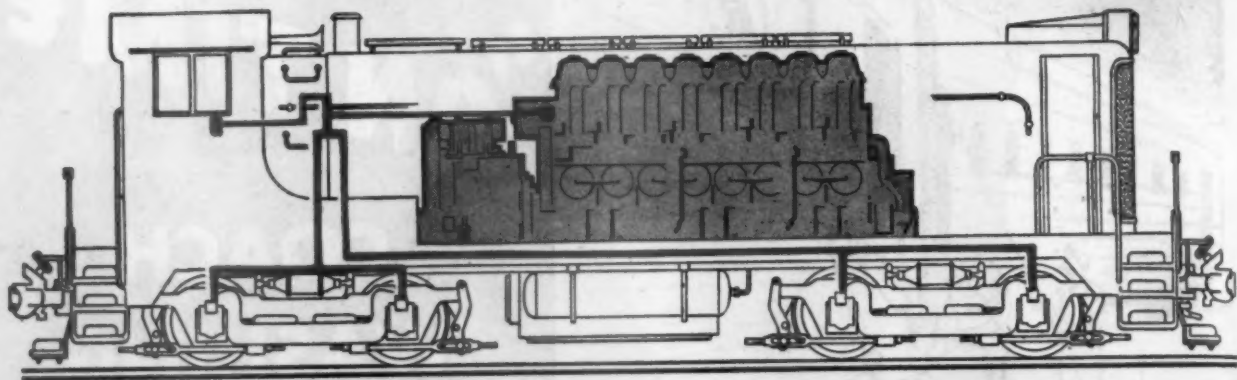
OAKITE PRODUCTS, INC., WRIGLEY BUILDING, CHICAGO 11, ILL.

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OAKITE
RAILWAY SERVICE DIVISION

This Automatic



**IN THE LEAD WITH
NEW DEVELOPMENTS**

Air Throttle Control
Automatic Wheel-Slip Control
Automatic Temperature Control
1-3, 2-4 Motor Load Transfer Hook-up
Life-extension for Liners
Advanced Electrical Features

Wheel Slip-Control

feature saves wear and shocks on

Baldwin-Westinghouse Diesel-Electrics

Wheels don't continue to slip and spin on the modern Baldwin-Westinghouse Diesel-Electric Locomotive when a start is made with a heavy load or a bad rail condition. The moment traction is lost the diesel engine speed is immediately and automatically throttled down by a simple, positive slip-control device. When slippage ceases engine speed smoothly increases to the point determined by position of throttle handle.

Excessive wheel and rail wear is halted . . . destructive shocks are avoided . . . and premature failures from these common causes are eliminated.

Wheel-slip prevention is only one of a number of important features—many of them exclusive on Baldwin-Westinghouse units.

Sixty railroads from coast to coast use these diesel-electric locomotives in various types of service.

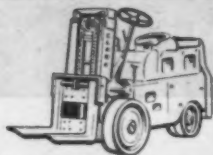
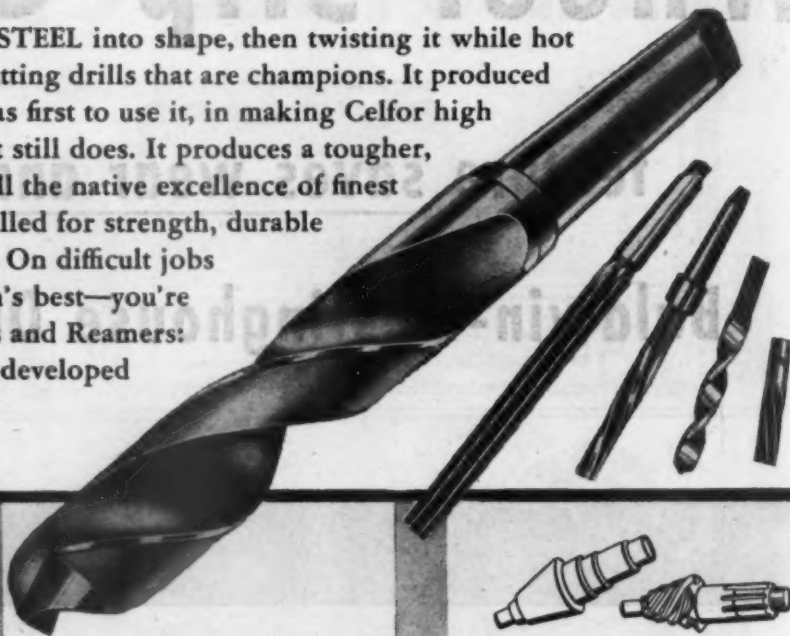


Westinghouse

ELECTRIC CORPORATION, EAST PITTSBURGH, PA.

Blood lines of CHAMPIONS . . .

FORGING FINE TOOL STEEL into shape, then twisting it while hot—this process produces cutting drills that are champions. It produced champions when Clark was first to use it, in making Celfor high speed Twist Drills—and it still does. It produces a tougher, denser metal—preserves all the native excellence of finest steels, makes tools unexcelled for strength, durable accuracy and long life . . . On difficult jobs that challenge a champion's best—you're likely to find Celfor Drills and Reamers: proving their blood lines developed by the Men of Clark.



FORK TRUCKS AND INDUSTRIAL TRACTORS

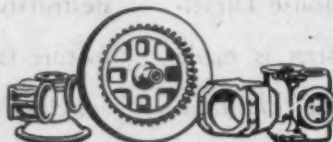
CELFOR HIGH-SPEED DRILLS AND REAMERS



GEARS AND FORGINGS



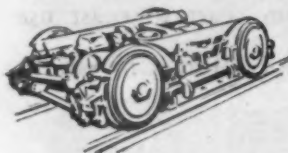
One piece, forged, heat treated AXLE HOUSING



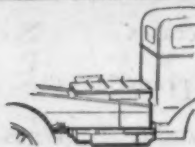
ELECTRIC STEEL CASTINGS



TRANSMISSIONS for Trucks, Busses, Tractors



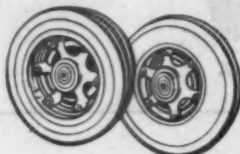
STREET RAILWAY CAR TRUCKS



POWER BOOSTER for 1 1/2-ton Trucks



BLIND RIVETING PROCESS



METAL SPOKE-TYPE WHEELS for Trucks, Busses, Trailers



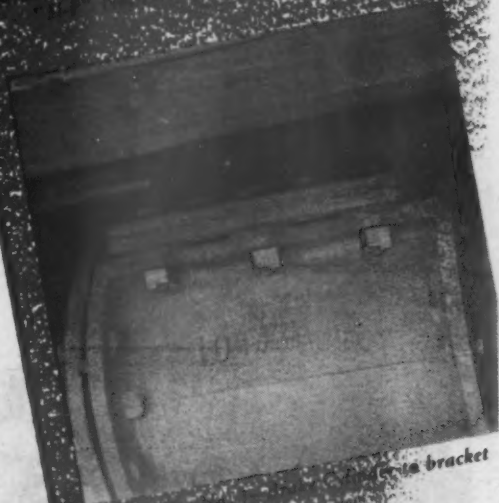
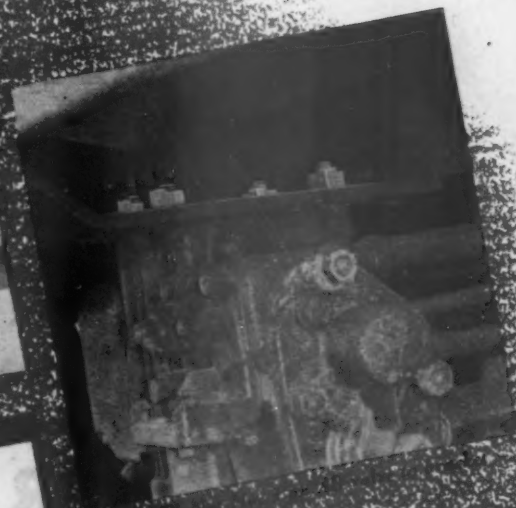
AXLES—front and rear for Trucks, Busses, Tractors



EASY-ROLL TRAILER AXLE

CLARK EQUIPMENT COMPANY
RAILWAY DIVISION - - - BATTLE CREEK, MICHIGAN

"M-F" Unitary Nut No. 3 on Brake Cylinder Reservoir to Bracket



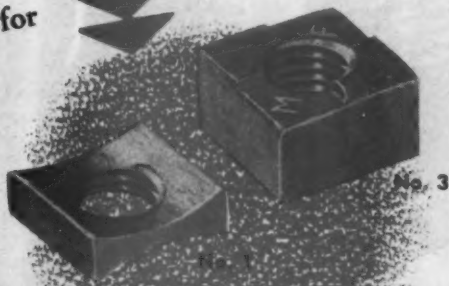
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When Applying AB BRAKES ... use "M-F" LOCK NUTS

Apply M-F Lock Nuts to these installations and you have an unshakable fastening . . . assurance that your AB brake equipment is there to stay.

M-F Lock Nuts have had a long and successful record in holding car parts together. Specify "M-F" No. 3 (Unitary) or No. 1 with a common nut for all AB brake applications.

"M-F" Lock Nuts are needed for an AB installation . . . an inexpensive guard over an important mechanism in freight car operation.



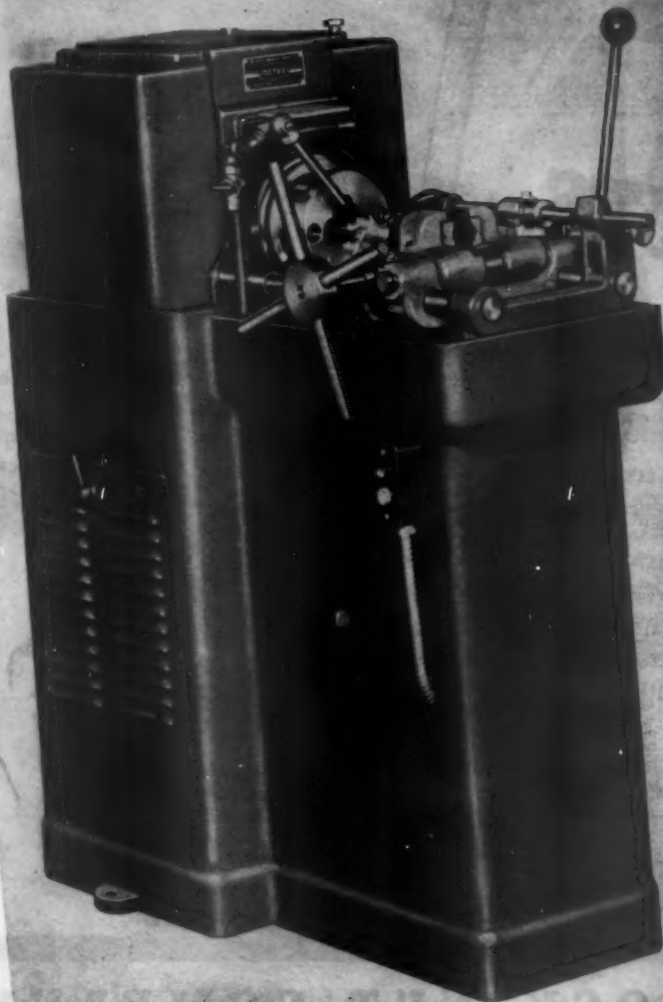
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OF THREADING JOBS
GIVE ME THIS**

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No. 542 "RAPIDUCTION JUNIOR" is designed with revolving die-head and open type vise to handle a wide variety of threading jobs at top speeds and low unit costs. No time lost in handling stock in and out of machine.

Production speeds on bolts, rods, studs, pipe and nipples are unusually high for this size of threading machine. (Write for production estimates on your specific work. Full description of work is requested.)

Standard range is $\frac{1}{4}$ " to $1\frac{3}{4}$ ".
Pipe or nipple range $\frac{1}{8}$ " to $1\frac{1}{4}$ ".

Complete information about the Oster No. 542 "RAPIDUCTION JUNIOR" Threading Machine is available from the Oster distributor in your area, or write direct to us at Cleveland, Ohio.



THE OSTER MANUFACTURING COMPANY, 2030 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

NATHAN

NATHAN



ON NORFOLK & WESTERN'S NEWEST PASSENGER LOCOMOTIVES

A NEW high mark in locomotive lubrication has been set on the Norfolk and Western's newest passenger power on which 220 points are lubricated from three Nathan Mechanical Lubricators. Two Nathan 14-feed Lubricators on the right side of the locomotive distribute oil to points on the engine truck, trailer truck, tender, driver pedestals, brake rigging, spring rigging, bell guides, reverse shaft, radial buffer, stoker and boiler expansion bearings. The Nathan Lubricator on the left side supplies oil to the cylinders, valves, throttle stuffing box and stoker engine. Air pumps and feed-water heater are also provided with mechanical lubrication. This thorough job of lubrication has resulted in more dependable operation and lower maintenance. The Norfolk and Western's new super locomotives are also equipped with Nathan injectors, boiler checks and low water alarms.

POINTS LUBRICATED FROM NATHAN MECHANICAL LUBRICATORS

Pedestal faces • Spring hangers • Center pin • Brake fulcrums • Driving box compensators • Flange oilers • Spring saddles • Brake hangers • Spring equalizers • Truck equalizers • Radius bar fulcrum • Rocker plates • Bell ringer • Valve guides • Main guides • Reverse shaft and arm • Radial buffer • Stoker shaft joints and bearings • Boiler bearings • Cylinders • Valves • Throttle stuffing box • Air pump • Feed-water pump • Stoker.

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250 PARK AVE.
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Established 1864

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19,938

AMERICAN CASUALTIES
AND ONLY 8 SQUARE MILES



● *Keep that guard up*

BACK THE MIGHTY 7th WAR LOAN



**PRODUCERS OF HAMILTON STEAM AND DIESEL ENGINES,
CANNON AND MACHINE TOOLS**

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

• THE HOOVER, OWENS, RENTSCHLER CO.

• GENERAL MACHINERY ORDNANCE CORPORATION

Man-What a Hose Clamp!

NO GEARS • NO BOLTS
NO THUMB SCREWS



IT'S ALL
ONE PIECE



New Speed Clamp* Features

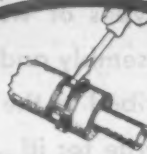
1. Exclusive, self-locking ratchet type design.
2. Lightest weight—lowest profile—sturdy spring steel construction.
3. Uniform circumferential pressure—no pinch or bind.
4. Faster and easier to install or remove.



Latch by hand



Lock with pliers



Remove with screw driver

Widely used throughout military aircraft. May be used over and over again. Sizes from 1/2" O.D. up. In writing for samples, please give outside diameter of hose with fitting inserted.

TINNERMAN PRODUCTS, INC.
2029 FULTON ROAD CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ont. In England: Simmonds Aerocessories, Ltd., London



*Trade Mark

Speed Nuts

PATENTED

Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

Speed Clamps for hose connections are engineered and produced by the manufacturers of the famous SPEED NUT shown above.

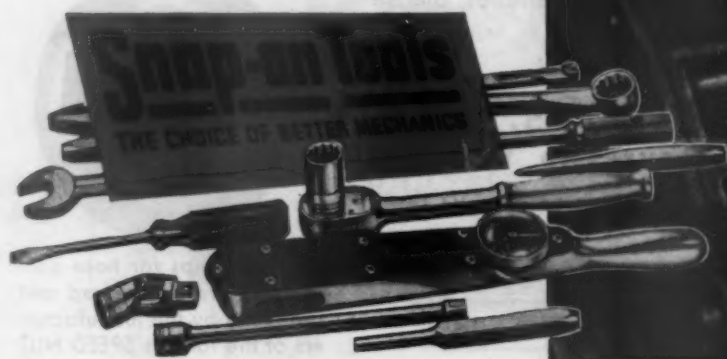
Fast, Flexible Snap-on Wrenches cut nut-turning time - speed assembly

MEASURED in man-hours and costs, nut turning stands out as the most important hand operation in industry. Millions of workers spend a large part of their time at nut turning. And the speed and quality of their work depends on wrenches... on the efficiency and *rightness-for-the-job* of the wrenches they use.

● For every nut turning operation there is a Snap-on wrench engineered to do the job better, faster, easier. On hundreds of assembly lines Snap-ons are standard equipment . . . the choice of better mechanics throughout industry . . . The most advanced types of wrenches for production, assembly and maintenance are described in the Snap-on catalog . . . write for it!

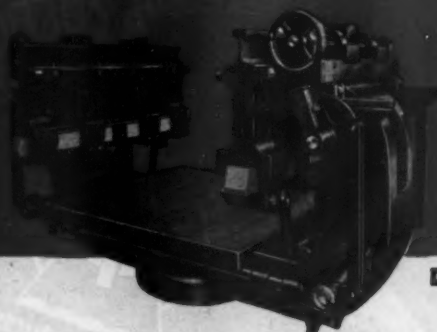
SNAP-ON TOOLS CORPORATION

8058-F 28TH AVENUE • KENOSHA, WISCONSIN



THESE POWERFUL JACKS

Speed REPAIR WORK



Drop Pit
Table



Hydro-Pneumatic Pit Jack
Telescopic Ram Type

● Repairs to locomotive trucks and wheels can be made with less tie up of equipment when Watson-Stillman Pit Jacks are under locomotives. They help to get them out of the roundhouse faster so that extra loads can be kept rolling without interruption.

W-S Pit Jacks and Drop Pit Tables have been standby equipment in many repair yards and roundhouses for nearly a century. Today they show the development and perfection acquired

by W-S's extensive background of experience in engineering and hydraulics.

W-S Hydraulic Pit Jacks are supplied with either plain or telescopic rams (the latter type do not need a sub-pit). They are operated on the hydro-pneumatic principle, and are equipped with air-driven or double-plunger hand pump.

W-S Drop Pit Tables have a positive wheel-locking device for absolutely safe operation. They are solid units with castings into which the pit jack ram adapter fits. Table castings are reinforced and fully capable of supporting the required loads. Three types—handle wheels of Pony and Tender, Driver and Trailer, or Truck.

Bulletin No. 510-A. One of a new series of bulletins describing W-S railroad shop equipment. It gives complete details and specifications of the various types, sizes and capacities of Pit Jacks; specifications on Drop Pit Tables, typical roundhouse layout, etc. For your copy of this Bulletin, 510-A, and others on W-S railroad shop equipment, write The Watson-Stillman Co., Roselle, New Jersey.



7342

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ROSELLE, NEW JERSEY

BRANCH OFFICES

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CHICAGO, ILL.

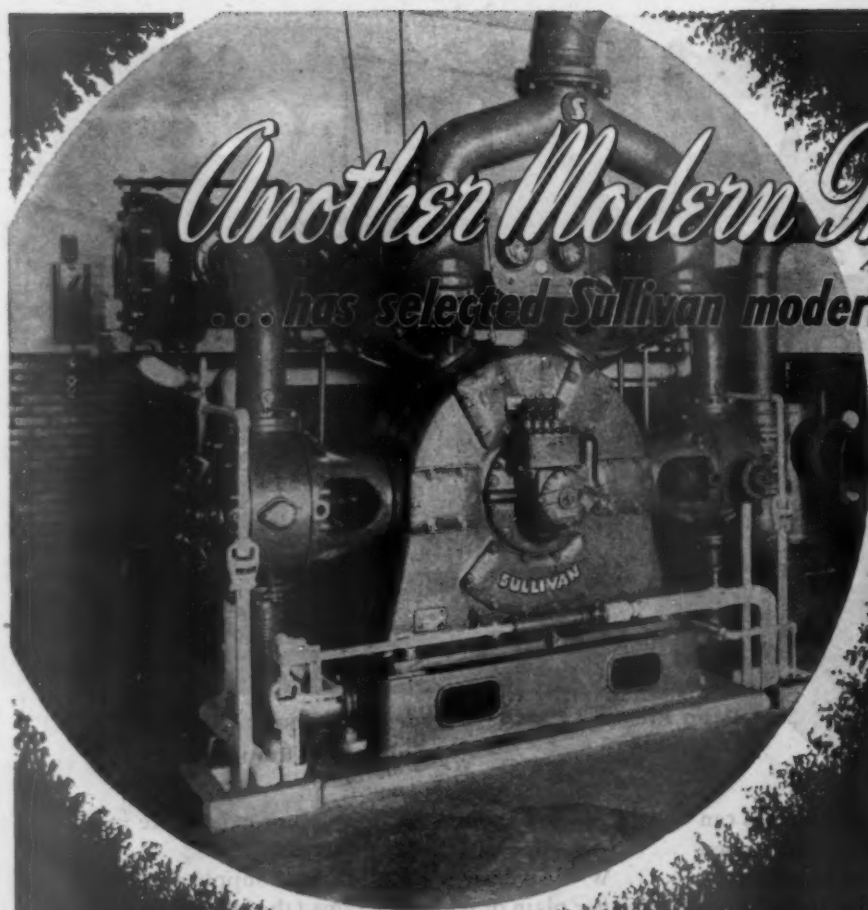
REPRESENTATIVES

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WATSON- STILLMAN



Another Modern Industry

...has selected Sullivan modern air power....



BELL Aircraft
Aircraft for victory—

LIKE so many other industries that have progressed by the bold and continued adoption of better and better methods, materials and machines, aviation has achieved the impossible in production of military planes. The contribution of compressed air from Sullivan modern air compressors cannot be emphasized too highly.

This SULLIVAN WN-114, four cylinder semi-radial air compressor recently installed in the newest plant of the largest aviation company, drives hoists, chucks, and boring mills, cleaning, sand-blasting and other air equipment and is used at reduced pressures in the all-important air-flow combustion control systems of the power plant itself. Many other aviation companies have similar installations working continuously.

Sullivan Series 100 Air Compressors are two-stage, double-acting, long-lived, heavy duty continuous service compressors—much more compact than old style compressors of the same capacity and yet have operating economies exceeding older and bulkier units. They are available in two and four cylinder models and in single or twin units with capacities from 375 C.F.M. to 1615 C.F.M.

Sullivan Machinery Company, Michigan City, Ind. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

SULLIVAN

AIR COMPRESSORS FROM 1/4 TO 3,000 H.P.

PRODUCTS

Stationary and portable air compressors from 1/4 to 3,000 H.P., pneumatic casting grips, foundation breakers, portable hoists, rock drills.

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Seattle
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Denver
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★ SEATTLE—
2 ALCO-G.E. DIESEL-ELECTRICS
★ TACOMA—
2 ALCO-G.E. DIESEL-ELECTRICS

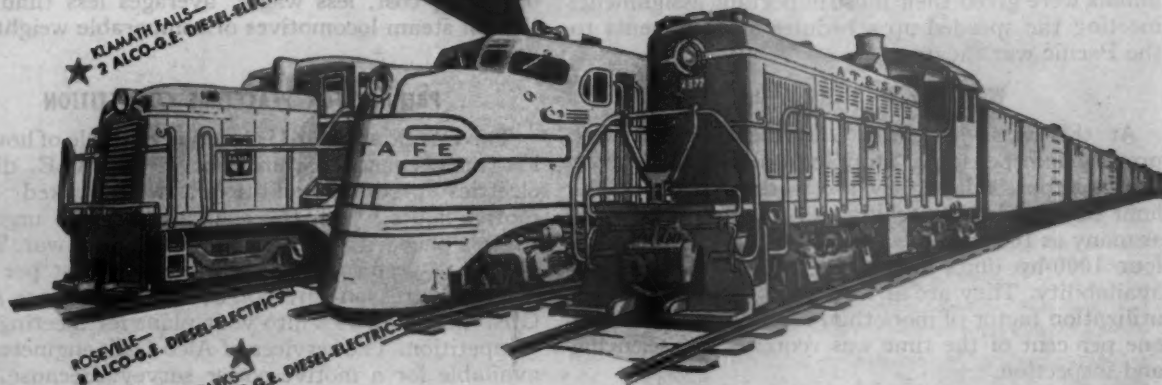
★ SPOKANE—
1 ALCO-G.E. DIESEL-ELECTRIC

★ PORTLAND—
30 ALCO-G.E. DIESEL-ELECTRICS
★ BROOKLYN—
2 ALCO-G.E. DIESEL-ELECTRICS

★ RUGBY—
5 ALCO-G.E. DIESEL-ELECTRICS

AS THE WAR MOVES WEST
Alco-G.E. diesel-electrics
168 of them
are helping Western roads
to get their second wind

★ KAMATH FALLS—
2 ALCO-G.E. DIESEL-ELECTRICS



★ ROSEVILLE—
3 ALCO-G.E. DIESEL-ELECTRICS
★ SPARKS—
4 ALCO-G.E. DIESEL-ELECTRICS

★ OAKLAND—
20 ALCO-G.E. DIESEL-ELECTRICS
★ STOCKTON—
10 ALCO-G.E. DIESEL-ELECTRICS
★ SAN FRANCISCO—
17 ALCO-G.E. DIESEL-ELECTRICS

★ FRESNO—
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★ BAKERSFIELD—
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★ MOHAVE—
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★ BARSTOW—
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★ LOS ANGELES—12 ALCO-G.E. DIESEL-ELECTRICS
★ LONG BEACH—1 ALCO-G.E. DIESEL-ELECTRIC
★ SAN BERNARDINO—
10 ALCO-G.E. DIESEL-ELECTRICS
★ NEEDLES—
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17 ALCO-G.E. DIESEL-ELECTRIC

★ YUMA—
2 ALCO-G.E. DIESEL-ELECTRICS
★ GILA—
3 ALCO-G.E. DIESEL-ELECTRICS

★ TUCSON—
17 ALCO-G.E. DIESEL-ELECTRICS
★ EL PASO—
3 ALCO-G.E. DIESEL-ELECTRICS

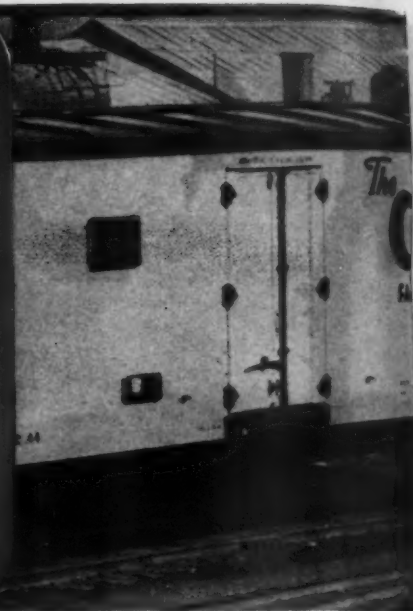
Alco



The accelerated time table of the Pacific war theatre piles additional demands on west coast yards and terminals, which have long been working at near capacity. On 20 to 24-hour daily assignments, 168 Alco-G.E. diesel-electrics are providing the locomotive-hours needed to meet the exacting shipping schedules required by the final drive on Japan.

90% "USE-ABILITY"

That's why Alco-G.E. diesel-electrics enable west coast yards to keep pace with the war in the Pacific



WHEN the center of war interest shifted from east to west—Pacific seaboard yards and terminals were given their most important assignment: meeting the speeded-up schedules for shipments to the Pacific war theatre.

WORKING 3 TRICKS A DAY

At this vital job, Alco-G.E. diesel-electrics are proving indispensable. Stopping only for fuel every third or fourth day, they are working three eight-hour tricks a day, switching and classifying trains of as many as 100 loaded cars. On one typical operation, four 1000-hp units are averaging 96.5 per cent in availability. They are at work 22.5 hours a day—a utilization factor of more than 93 per cent. Less than one per cent of the time was required for servicing and inspection.

SERVICED DURING LUNCH HOUR

A 380-hp (44-ton) unit at another location often works every hour of the day, handling trains of 20

to 22 loaded cars. Its daily servicing and inspection are completed during the lunch period, and its total operating cost, less wages, averages less than half that of steam locomotives of comparable weight.

PREPARE FOR PEACETIME COMPETITION

The Pacific seaboard is but one example of how the low maintenance requirement of Alco-G.E. diesel-electrics produces additional work-packed locomotive-hours which the railroads need so urgently to keep pace with the growing demands of war. Their ability to perform this service at low cost per ton-mile is the reason why you should incorporate Alco-G.E. diesel-electrics into your plans for meeting stiff competition. The services of Alco-G.E. engineers are available for a motive-power survey. Because they have all three types of motive power at their disposal—diesel-electric, electric, and steam—they can recommend the one which is economically best suited to your operations.



10-YEAR-OLD ALCO-G.E. UNIT—it often works 24 hours a day breaking up 75-car trains at the Santa Fe's Fresno yard. Since 1935, it has been available for work 80,000 hours, and its average maintenance cost during the entire period has been very low.



AMERICAN LOCOMOTIVE



1600-HP ALCO-G.E. diesel-electric switching refrigerator cars at San Bernardino, Cal.



PACIFIC ELECTRIC'S FIVE 44-TONNERS are doing a gallant job of keeping war supplies moving in the Los Angeles area. One unit, at San Bernardino, starts its day with a round trip into the mountains, works the rest of the day at-switching, and at night makes another 60-mile round trip with a string of cars. Pacific Electric depends on these diesel-electrics day in and day out.



"SAN DIEGAN," crack streamliner of the Santa Fe, being "Y-ed" at San Diego for its return trip to Los Angeles. In addition to handling close-schedule passenger-train switching, this 44-ton diesel-electric does the industrial switching at San Diego. Its availability for work during three recent months averaged 97.7 per cent.

4 ALCO-G.E. DIESEL-ELECTRICS RELEASE 6 STEAM ENGINES for Southern Pacific main-line service. Switching freight and passenger cars in the Sparks, Nevada, yards, these diesel-electrics are in service 24 hours a day, and need refueling—which takes but 30 minutes—only once every three days. Their only time out of service is a roundhouse check-up once a month.

ALCO-G.E. FLEETS OPERATED BY RAILROADS SERVING THE WEST COAST

| | |
|--|----|
| Alameda Rail Line | 2 |
| Los Angeles Junction Railway Co. | 2 |
| Southern Pacific Co. | 74 |
| Pacific Electric | 5 |
| State Belt Railroad of Cal. | 4 |
| Western Pacific | 16 |
| Northern Pacific Terminal | 8 |
| Spokane, Portland & Seattle | 12 |
| Union Pacific | 19 |
| Great Northern | 15 |
| Santa Fe | 24 |
| San Francisco & Napa Valley | 3 |
| Chicago, Milwaukee, St. Paul & Pacific | 23 |
| Canadian Pacific | 10 |

and GENERAL ELECTRIC

GENERAL SPECIFICATIONS

covering standard sizes of Alco-G.E. diesel-electrics

| | 380-HP SWITCHER | 660-HP SWITCHER | 1000-HP SWITCHER | 1000-HP ROAD SWITCHER |
|---|-----------------|-----------------|-------------------------|-------------------------|
| Starting tractive effort (at 30% adhesion) | 26,400 lb | 58,700 lb | 69,000 lb | 69,000 lb |
| Engine | Two, 6-cyl | One, 6-cyl | One, 6-cyl Supercharged | One, 6-cyl Supercharged |
| Driving Motors | 4 | 4 | 4 | 4 |
| Maximum speed restriction | 35 mph | 60 mph | 60 mph | 60 mph |
| Driving wheels (number) | 4 pairs | 4 pairs | 4 pairs | 4 pairs |
| Driving wheels (diameter) | 33 in. | 40 in. | 40 in. | 40 in. |
| Weight on drivers, fully loaded | 88,000 lb | 199,000 lb | 230,000 lb | 230,000 lb |
| Wheelbase, each truck (rigid) | 6 ft 10 in. | 8 ft 0 in. | 8 ft 0 in. | 8 ft 4 in. |
| Locomotive truck centers | 18 ft 9 in. | 30 ft 0 in. | 30 ft 6 in. | 40 ft 6 in. |
| Over-all locomotive dimensions | | | | |
| Height | 13 ft 3 in. | 14 ft 4 in. | 14 ft 6 in. | 14 ft 6 in. |
| Width | 10 ft 1 in. | 10 ft 0 in. | 10 ft 0 in. | 10 ft 0 in. |
| Length (inside knuckles) | 33 ft 5 in. | 44 ft 5 3/4 in. | 45 ft 5 3/4 in. | 54 ft 11 3/4 in. |
| Minimum radius curvature (locomotive alone) | 50 ft | 50 ft | 50 ft | 100 ft |
| Supplies (total capacity) | | | | |
| Lubricating oil | 50 gal | 80 gal | 80 gal | 80 gal |
| Fuel oil | 250 gal | 635 gal | 635 gal | 1600 gal* |
| Engine-cooling water | 40 gal | 220 gal | 240 gal | 240 gal |
| Sand | 8 cu ft | 27 cu ft | 27 cu ft | 27 cu ft |
| | | | | 800 gal |
| | | | | 800 gal |

*If boiler is applied
Boiler-water tank.....
Fuel-oil tank.....



380-HP (44-TON) SWITCHER—reduces motive-power requirements because of its all-round usefulness—it can handle switching, transfer service, and road work up to 35 mph.



660-HP SWITCHER—A study of 30 of these units that have been in operation more than three years shows an average maintenance cost of 24 cents per locomotive-hour.

1000-HP SWITCHER—In one midwestern yard, six of these units make twice as many locomotive-hours available as is being turned in by 14 steamers of comparable size.

Alco



AMERICAN LOCOMOTIVE AND GENERAL ELECTRIC

A few simple rules to conserve carbide tools

FIRTHITE
FIELD SERVICE POSTERS
are available for display
in your plant

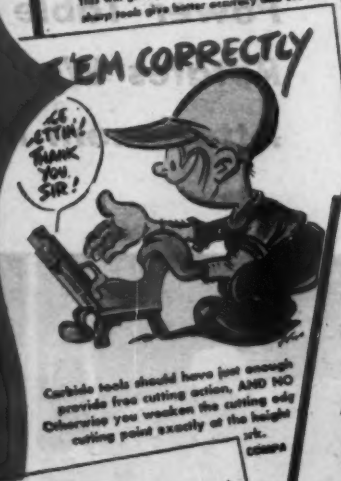
The conservation of carbide tools through proper handling and correct usage is essential not only in war time but at any time for best production results and low operating costs.

These Firthite field service posters will help remind your plant operators in simple, easy-to-take, understandable manner, of the right way to make carbide tools do their utmost.

Fill in and mail the coupon for your set of these free, 17" x 22", four-color posters.

Firth-Sterling
STEEL COMPANY

OFFICES: McKEESPORT, PA. • NEW YORK •
HARTFORD • PHILADELPHIA • PITTSBURGH • CLEVELAND
• DAYTON • DETROIT • CHICAGO • LOS ANGELES



.....

FIRTH-STERLING STEEL CO., Dept. RME—McKeesport, Pa.

Please send us without obligation on our part _____ sets of Firthite Field Service Posters which we wish to display in our plant shops.

NAME _____ TITLE _____

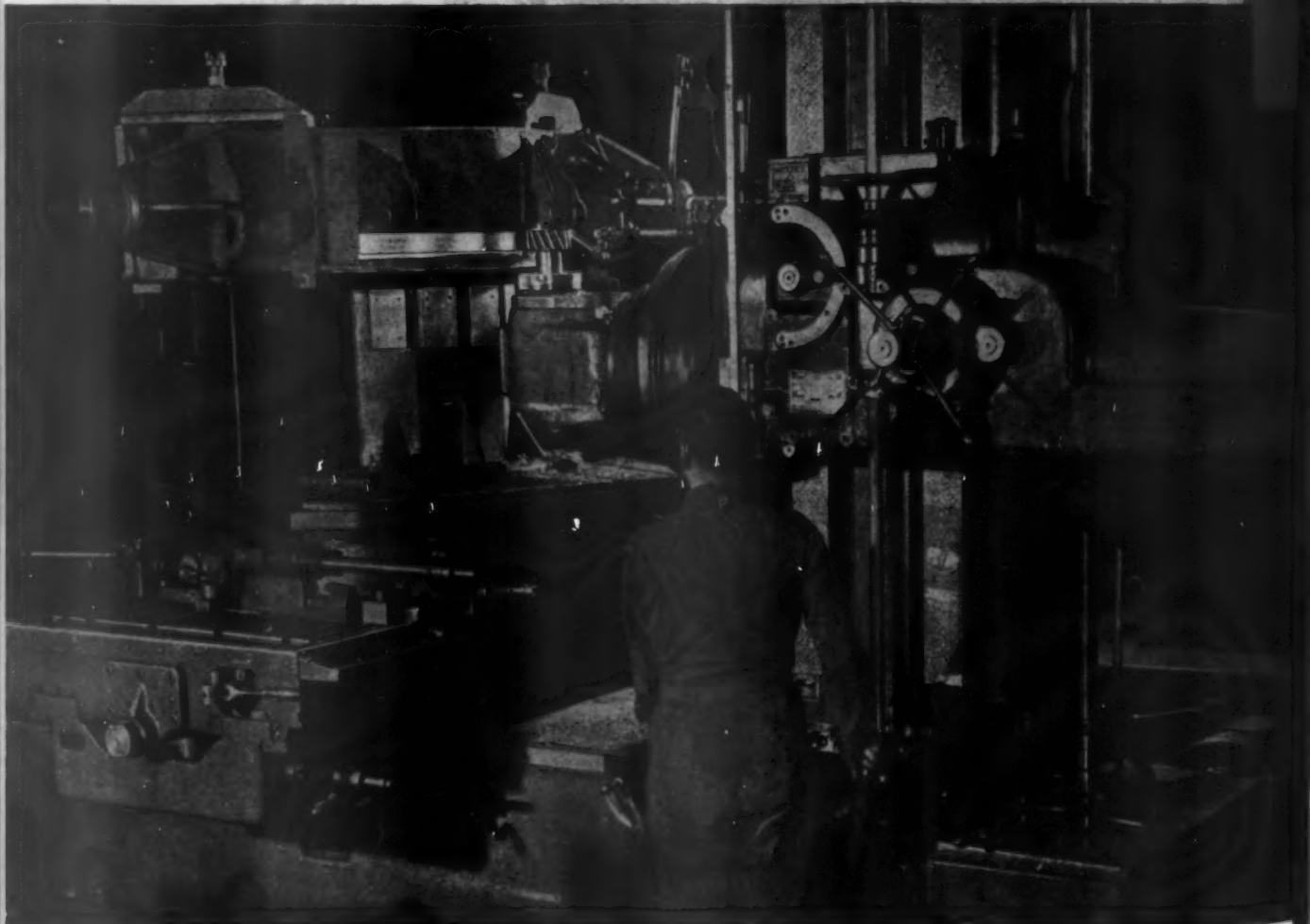
COMPANY _____

ADDRESS _____

HERE'S THE *Simple* **WAY TO**
COMPLETE 7 *difficult*
RADIUS MACHINING OPERATIONS!

G. & L. Horizontal Boring Machine showing howitzer bottom carriage, holding fixture, power driven rotary table and angular milling attachment.

**Power Table on G. & L. Machine
 Rotates Work While Right Angle
 Attachment Makes Milling Cuts...**



**Right: G. & L. Table
 Type Machine.**

GIDDINGS & LEWIS

150 DOTY STREET

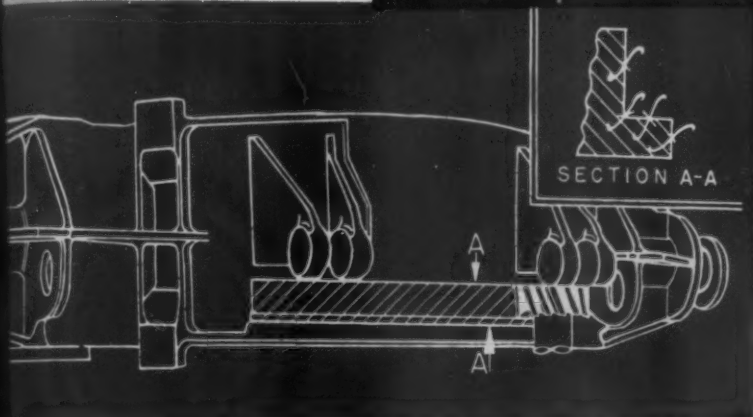


**Right: G. & L. Floor
 Type Machine.**



(Right) Close-up view showing radius milling operation. Note position of radius being machined and how clearance is obtained by positioning angular milling attachment.

(Below) Outline drawing of bottom carriage with radius machining indicated.



Machining a difficult radial bearing surface on this howitzer bottom carriage is efficiently handled on a standard G. & L. Horizontal Boring Machine with standard time-saving G. & L. Attachments. A study of the work being done shows it is impractical to perform these operations on any other type equipment because of the location of the surfaces to be machined in respect to interfering brackets and other projections.

Seven radius machining cuts are required; these include rough and finish radius ledge cuts; rough, semi-finish and finish radius cuts; one chamfer and one slotting clearance cut.

HOW RADIUS CUTS ARE MADE

A G. & L. angular milling attachment, driven by the machine spindle, is positioned with the cutter up. This gives the needed clearance for the workpiece to rotate on a G. & L. power driven rotary table. As the part turns, the milling cutter of the angular attach-

ment makes its cut. The rotation of the table gives the required radius. A special fixture mounted on the rotary table is used to hold the work.

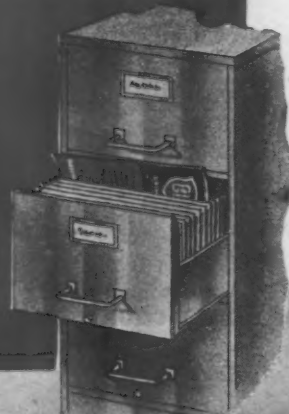
FLEXIBILITY OF STANDARD G. & L. MACHINES AND ATTACHMENTS

This excellent example shows how a difficult machining problem was solved with standard G. & L. equipment. You may need similar machine flexibility to produce your work. Consult Giddings & Lewis engineers who will advise you how to produce more parts at less cost on the G. & L. Horizontal Boring, Drilling and Milling Machines.

MACHINE TOOL CO.
FOND DU LAC, WIS.

Additional Data

... complete information available on Giddings & Lewis machines, attachments and time-saving attachments. Write for Bulletin No. 22-1000. Please include your business connection.



Left: G. & L. Planer Type Machine.

Left: G. & L. Multiple Head Type Machine.

For
less time
in the roundhouse,
more time
on the road,
you need

highest quality
shop equipment

H. ARMSTRONG ROBERTS

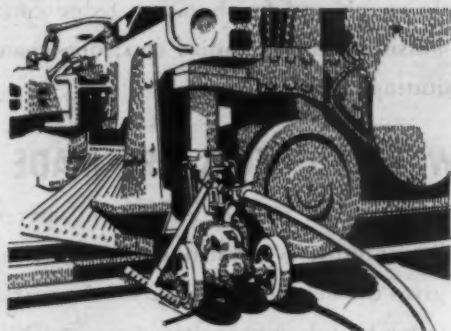
Duff-Norton Jacks

Duff-Norton Jacks provide the safe, speedy lifts that help cut maintenance and repair time and move equipment out of the roundhouse and back into service faster. Top quality Duff-Norton Jacks have been favorites with railroad men for many years because of their proven dependability and ease of operation. You can always count on Duff-Norton Jacks in your locomotive and car service work.

The Duff-Norton Manufacturing Co.
PITTSBURGH, PA.

Canadian Plant:
COATICOOK, QUE.

Representatives in
Principal Cities



Duff-Norton Jacks

BUILT FOR RAILROAD SERVICE

The complete Duff-Norton line includes a Railroad Jack for every job and preference . . . from 100 ton capacity Rotary Air Motor Operated Power Jacks to the smallest manually-operated Screw Jacks. Our latest catalog tells the full story. Write for your copy.

RAILWAY MECHANICAL ENGINEER

ONLY ONE ELECTRODE IS HARD TO MAKE

that's the **FIRST ONE**

CAN YOU ANSWER THESE QUESTIONS about Welding of Stainless Steels?

- | | TRUE | FALSE |
|--|--------------------------|--------------------------|
| 11. Molybdenum is added to stainless steels to increase their scaling resistance at elevated temperatures. | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Not all stainless steels are classified by metallurgists as "austenitic." | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. Stainless steel electrodes are used on reverse polarity because they will not operate satisfactorily on straight polarity. | <input type="checkbox"/> | <input type="checkbox"/> |

Answers: 11. True, 12. True, 13. True.

Questions 1 to 10, inclusive, have appeared in preceding advertisements. Other questions will appear next month. Watch for them!

The first electrode of a new type, or a definite improvement of an old one, is always hard to make.

Once the perfection of the "sample" is established, the ability to turn out millions of duplicates belies the difficulties overcome in the creation of that *first* satisfactory new one. Months, sometimes years, of research and experiment are necessary in our own laboratories and through our Fellowship at the Mellon Institute, to achieve the exact combination of physical properties, operating characteristics and standards of performance required of each new McKAY Electrode.

Thereafter, all others of the adopted type, are copies of the original.

That these "copies" may be faithful reproductions, McKAY assures uniform production by careful analyses of core wire and coating ingredients, constant supervision, frequent checks of production samples and rigid inspection.

So, from *first* to *last* . . . from research through production . . . McKAY mild, alloy and stainless steel electrodes are made to be better. Try them and see.

Send for this Booklet

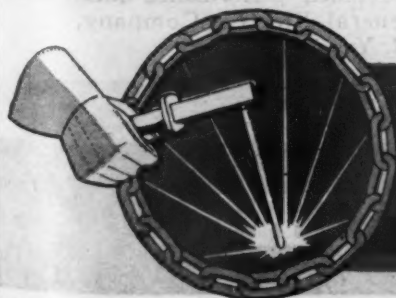
A limited number of these valuable booklets are still available for distribution. We shall be glad to send you a copy upon request. Ask for "Things to Know about Welding Stainless Steel."



GENERAL SALES OFFICES: YORK, PA.

THE **McKAY** COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS





NOW TRY for FASTER,

A.W.S. CLASSIFICATION E6020/E6030

*Welds made with W-27 electrodes
meet these requirements.*

1. High mechanical properties
2. Rigid X-ray examination
3. Excellent profile appearance
4. Excellent surface appearance
5. High deposition rate

● This new, heavily covered electrode—Type W-27—is specially designed for flat and horizontal fillet welding and flat groove welding at medium to high alternating or direct currents.

Proved by extensive laboratory and field tests, which have been confirmed by shop production data, the W-27 is the most advanced heavily covered electrode available for its particular applications.

Meeting A.W.S. E6020/E6030 requirements, this new electrode's stable, forceful arc produces deep penetration and a heavy slag, which completely covers the deposit, yet is easy to remove. Welds made with W-27 are outstanding in appearance and have ample margin over requirements of A.W.S. specifications.

For applications involving flat or horizontal

fillet welding or flat groove welding, and capable of being fabricated at high currents, this electrode's higher melting rate allows faster welding—increases production.

Where heat input is a critical factor, the W-27's higher melting rate allows satisfactory welding speeds at less than normal current input. The work, therefore, shows less warpage and less crack sensitivity, and there is a marked reduction in locked-up stresses in deposited weld metal.

Since only its use in actual production will prove the value of any electrode, why not ask your G-E arc-welding distributor for samples of the W-27 and let your own operators be the judges. Your distributor can also provide you with more detailed performance data. Or, write to General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

OUR NEW W-27 ELECTRODE

BETTER FLAT AND HORIZONTAL WELDING



For horizontal flats, the W-27's liberal and strong arc set up evenly on the vertical plate, assuring welds having equal legs.



Because of its exceptionally high melting rate, plus its ability to handle high currents, the Type W-27 permits faster welding—increased production.



**ARC WELDING
ELECTRODES
and
EQUIPMENT**

RANGE OF MECHANICAL PROPERTIES

| | As Welded | Stress Relieved |
|------------------------------------|---------------|-----------------|
| Tensile strength, lb per sq in... | 63,000-68,000 | 61,000-65,000 |
| Yield strength, lb per sq in.... | 53,000-57,000 | 47,000-52,000 |
| Per cent elong. 2 in..... | 27.0-32.0 | 32.0-38.0 |
| Per cent reduction of area..... | 54.0-62.0 | 60.0-66.0 |
| Impact resistance ft-lb izod..... | 50-70 | |
| Endurance limit, lb per sq in..... | 30,000-34,000 | |
| Density, grams per cu cm.... | 7.83-7.86 | |
| Brinell hardness..... | 150-170 | |

Buy all the BONDS you can
— and keep all you buy

This happens to the best galvanized sheets...

Galvanized sheet steel is an excellent metal for many purposes, but there is one thing it won't do. It won't take and hold paint satisfactorily. The photo tells the story. The raw zinc surface dried out the essential oils in the paint, caused it to become brittle. Result: early paint failure.

This happens even when the zinc surface is acid-etched. Etching has other disadvantages, too. Besides being slow and costly, it destroys part of the protective zinc coating.

Paint on regular galvanized steel isn't satisfactory . . .



But this bonds paint to zinc

ARMCO Galvanized PAINTGRIP sheets are the answer to this old problem. They can be painted immediately. Tests show they take and hold paint even better than a sand-blasted hot rolled sheet. What's more, they give your products this *triple protection* . . .

1. The high-quality steel base has a *full-weight zinc coating*.
2. The coating is given a special Bonderizing treatment at the Armco mills.
3. This "insulated" surface grips paint in a lasting bond—prevents it from drying out quickly and peeling and flaking.



Whatever railway equipment you make of galvanized sheet steel that is to be given an *attractive and durable* paint finish, ARMCO Galvanized PAINTGRIP sheets are the logical choice. Write for the free PAINTGRIP booklet. It gives complete information. Just address Armco Railroad Sales Co. Inc., 1491 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION



The "Scratch Test" shows how paint sticks to ARMCO Galvanized PAINTGRIP Steel. The top half of the sample is mill-Bonderized. When scratched with a pen knife only a slight mark can be seen. Paint on ordinary galvanized (bottom half) scrapes off readily.

ARMCO
Railroad Sales Co. Inc.

SPECIAL-PURPOSE SHEET STEELS



New

'MITT-GRIP'

COLLAR

FOR WELLS' *Stubby*
ELECTRODE HOLDER

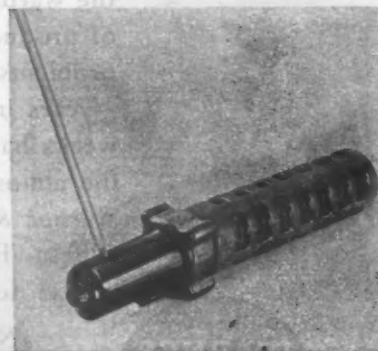


Model 3R
300 Amp.

A new 4-cornered plastic collar that prevents the insulator from slipping in the mitt when changing rods, has been added to the Martin Wells *Stubby* electrode holder. It gives *Stubby* these additional features:

- Makes rod-changing *easier* and *quicker*, because it provides a positive, convenient grip on the insulator.
- Holds small rods upright and away from contact with work because corners of "mitt-grip" collar keep holder from rolling.
- Collar remains cooler than cap—making rod change comfortable.

Ask your local distributor for more details about the new *Stubby* with "mitt-grip" collar.



Exclusive Manufacturer

Martin Wells

5886 Compton Ave.,
Los Angeles 1, California

Bay City — Northern Supply Company
Birmingham — Ebbert & Kirkman Co. Inc.
Cedar Rapids — L. B. Lamb Sales Co.
Chicago — Steel Sales Corp.
Cincinnati — Williams & Co. Inc.
Cleveland — Williams & Co. Inc.
Columbus — Williams & Co. Inc.
Milwaukee — Steel Sales Corp.

Detroit — Steel Sales Corp.
Weldit Acetylene Co.
Houston and throughout Texas —
Magnolia Alcoa Gas Products Co.
Hawthorne — Magnolia Gas Products, Ltd.
Minneapolis — Steel Sales Corp.
Montreal — Redel Machinery Co.
New York — Chicago Combustion Co.
Vancouver, B.C. — Scott-Foster & Co.

Omaha — The Bullock Company
Pasha Machinery & Supply Co.
Phoenix — Arizona Welding Equipment
Pittsburgh — Williams & Co. Inc.
Saginaw — Northern Supply Co.
St. Louis — Steel Sales Corp.
San Francisco — Pitts & Loughlin
Spokane — Gibson Welding Supply Co.

AIR REDUCTION SALES CO. • OFFICES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES

**FIRST ON THE JOB...
AND LAST OFF!**



WHEN Pearl Harbor first shocked the country into action, "Put it on the Warner & Swaseys," was the battle cry of production men with urgent turning problems. Today, long, weary years later—years in which 3-shift days and 7-day weeks have tested men and machines to the utmost—it is significant to note that Warner & Swaseys are usually the last lathes to be laid off when a contract comes to a close.

Not only that! When the government-owned equipment in a plant is declared surplus, it's usually the

Warner & Swaseys that are snapped up first by production-wise managements.

Why? The answer is simple! In the grueling, all-out test of machine tools, these Warner & Swasey machines simply stood up better, produced faster, gave less trouble.

When you plan your next equipment change, remember these war-proved facts. Let a Warner & Swasey Field Engineer help you choose the right Warner & Swasey war-tested turret lathes to boost your peacetime profits!

**WARNER
&
SWASEY**
Cleveland

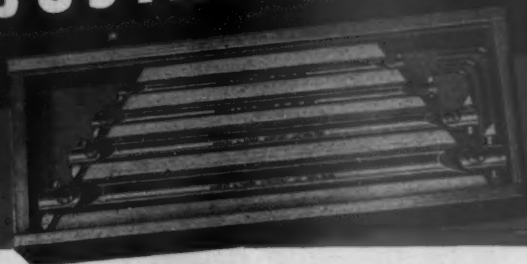
YOU CAN MACHINE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES — CHUCKING AND BAR TOOLS — PRECISION TAPPING AND THREADING MACHINES

Quick ON-THE-JOB ADJUSTABILITY



Clark Adjustable
Tool Holder



Clark Adjustable
Tool Holder



Clark Adjustable
Countersink



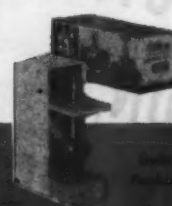
Clark Adjustable
Hole Cutter



Clark Adjustable
Face Milling Cutter



Clark Thread Tool
Grinding Fixture



Clark Right-
Handed Right



Clark Adjustable
Bit Cutter

with **Clark** CUTTING TOOLS

That's why good machinists everywhere prefer Clark Adjustable Cutting Tools. Their *quick* adjustability means fewer trips to the tool crib and more productive time on the job. Clark Cutting Tools give cleaner cuts because they *fit* the job. Each Clark Cutting Tool has a wide range of sizes and does the work of several other tools. There are Clark Adjustable Cutting Tools for ALL materials.

CLARK



CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD

BEVERLY HILLS, CALIFORNIA

For complete information,
call your Clark Cutter Jobber
today, or write for catalog RME-6-CT

ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS



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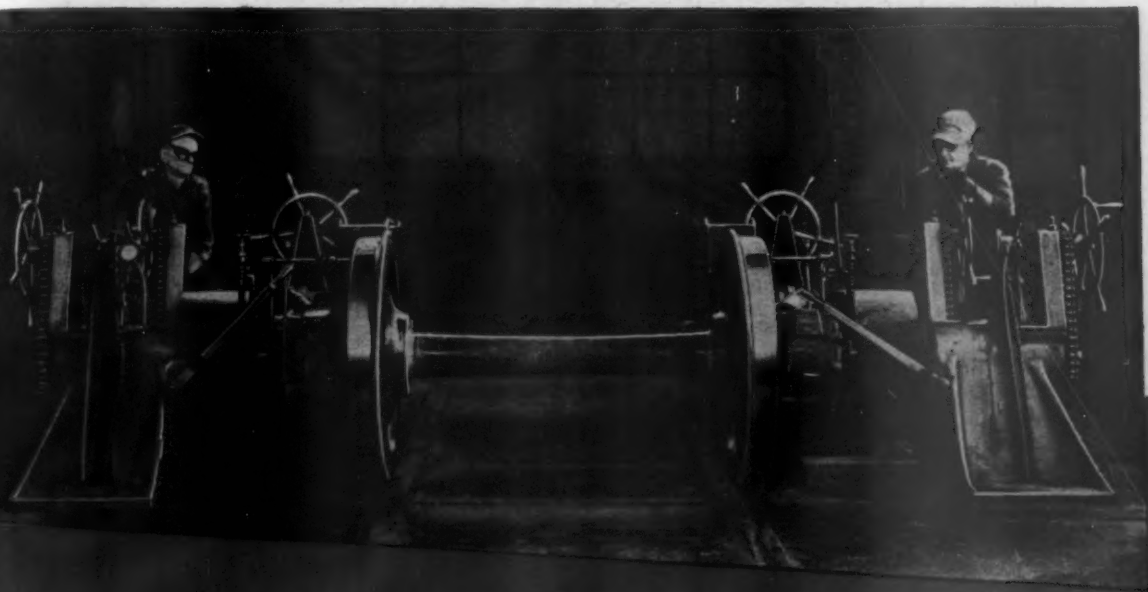
- ★ LONGER WHEEL LIFE
- ★ GREATER PASSENGER COMFORT
- ★ LADING PROTECTION
- ★ LESS VIBRATION
- ★ POLICES MOUNTING PRACTICE



"A high spot of 1/32 in. may help to cause sliding and it has been shown by test that such a high spot is usually found about 60 deg. from a slid-flat, which is about the angle between the contact with the rail and the contact of the brake shoe. If these high spots and other eccentricities are eliminated from new wheels before they are put into service, the tendency to slide is reduced and the riding of the car is greatly improved with attending benefit to track, equipment and lading."

Wheel and Axle Manual
ASSOCIATION OF AMERICAN RAILROADS

YOUR WHEELS to PERFECT TREADS



ECCENTRICITY in wheel pairs is common, even after careful boring and machining of individual wheels and axle. Grinding of mounted wheels is the sure method of obtaining smooth treads of identical circumference, truly concentric with journals.

The **Q.C.F. HIGH SPEED WHEEL TREAD GRINDER** detects and corrects, simultaneously. It "polices" manufacturing, boring, mating and mounting practices — assures smooth treads and concentricity — less brake shoe sticking — less vibration and smoother riding — less damage to loading, trucks and rails — less noise. All chilled car

wheels installed in cars built in Q.C.F. shops are ground after mounting.

In maintenance work, the Q.C.F. Grinder removes all flats and other service defects from steel or chilled car wheels, prolonging wheel life.

One man can easily grind 11 pairs of new chilled car wheels per hour, and the operating cost is infinitesimal. Railroads find that grinding offers the only means of economically servicing heat treated steel wheels.

Savings from salvaged wheels and remounting will pay for grinder in two to three years.

WHATEVER Q.C.F. BUILDS—IT IS KNOWN TO BUILD WELL!

Q.C.F. AMERICAN CAR AND FOUNDRY COMPANY

NEW YORK • CHICAGO • ST. LOUIS • CLEVELAND • WASHINGTON • PHILADELPHIA • PITTSBURGH • ST. PAUL • SAN FRANCISCO

ALCOA A-C-S-R



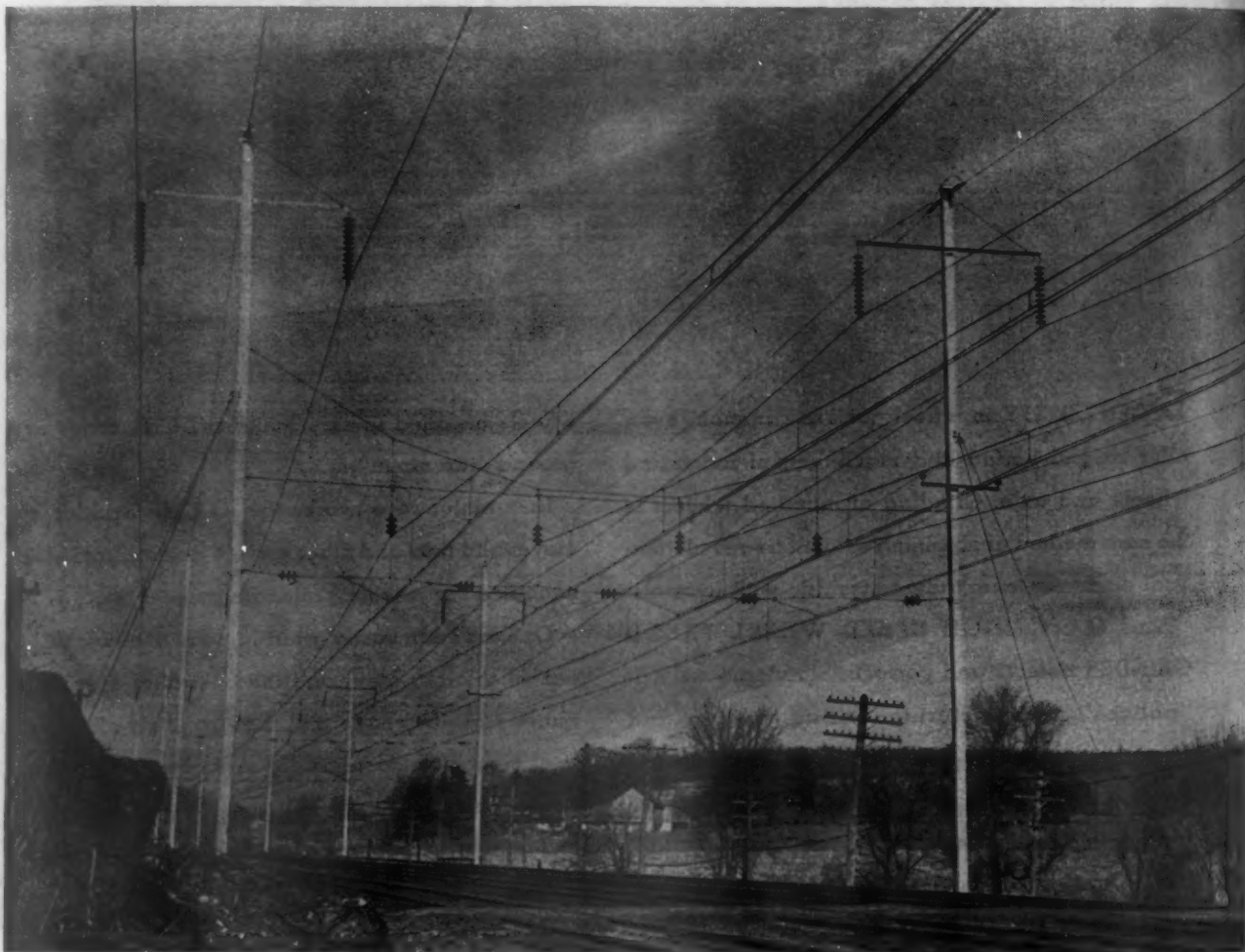
One of the most dependable conductors of electricity on the Pennsylvania Railroad

This conductor is always on the job . . . always ready for service . . . always dependable . . . it's the Alcoa A.C.S.R. (Aluminum Cable Steel Reinforced) used on the Pennsylvania Railroad between Paoli and Enola.

Aluminum wires around a core of steel provide the combination of high current

carrying capacity, high strength and dependability so important in the operation of electric lines.

More than a million miles of Alcoa A.C.S.R. are now in service as proof that you can depend upon it to deliver the goods. ALUMINUM COMPANY OF AMERICA, 1929 Gulf Building, Pittsburgh 19, Pa.



477,000 cm A. C. S. R. operating at 132,000 volts is used on the Paoli-Enola (Harrisburg) section of the Pennsylvania Railroad

ALCOA ALUMINUM



WHICH ARMATURE WOULD YOU PICK?

Sure, they look exactly alike. But there is an important difference which does not meet the eye: *One* has accurate static and dynamic balance.

In railroad service, as in other industry, all armatures and motor rotors subjected to hard usage require periodic electrical and mechanical reconditioning. Most progressive railroad repair shops now realize that *re-balancing* is an essential final step in this process, to help restore original high efficiency, smooth operation, and long life when these rotating parts are returned to service.

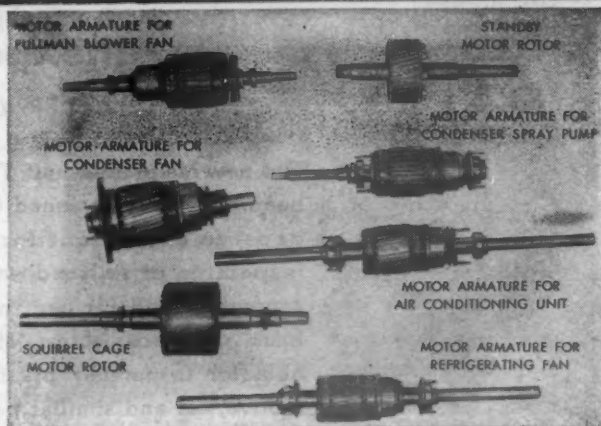
GISHOLT DYNETRIC BALANCING MACHINES* (types and sizes for all service needs—built to the Gisholt Standard) have won wide acceptance among railroads as the ideal equipment to do away with vibration, excessive wear, and bearing overloads. They measure unbalance which creeps into rotors either through usage or through other maintenance operations. And GISHOLT DYNETRICS pay for themselves. Write for details.

*A development of Westinghouse Research Laboratories.

GISHOLT MACHINE COMPANY

1293 East Washington Ave. • Madison 3, Wisconsin

Look Ahead...Keep Ahead...With Gisholt



Group of Armatures and Motor Rotors Balanced on 35 Dynetric Balancer in the Electrical Shop of One of the Large Railroads.



DYNETRIC BALANCING is the quick and low-cost means of insuring better performance and longer life in many parts such as these in railway service. Locating and measuring unbalance corrections takes only a matter of seconds.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

**TO MEET THE OVERHAUL INSPECTION REQUIREMENTS
OF THE SMALLER ROUNDHOUSE AND BACK SHOP**



A NEW MAGNAFLUX* UNIT

Inexpensive • Mobile • Rugged

[PRICE, \$455.00 COMPLETE, F. O. B. CHICAGO]

The new Magnaflux unit, Type KT-2.5, has been especially designed to provide inexpensive equipment for the overhaul inspection of railroad equipment. It is recommended for use in roundhouses, back shops, car shops, etc., and is suitable for inspecting practically all locomotive, car and similiar parts.

The Type KT-2.5 unit is ruggedly and compactly constructed with an all-welded

steel frame. It is built in push-cart style with folding handle-bars and 16 inch rubber tired wheels. It is also equipped with heavy eye-bolts to facilitate handling with an overhead hoist.

This new highly mobile Magnaflux unit fits the requirements of the smallest roundhouse or back shop and completes a line of units designed to meet all railroad overhaul inspection requirements.



**Magnaflux—the Trade Mark of the Magnaflux Corporation
applied to its equipment, materials and inspection methods.*

M A G N A F L U X C O R P O R A T I O N

5920 Northwest Highway, Chicago 31, Illinois

NEW YORK

• DETROIT

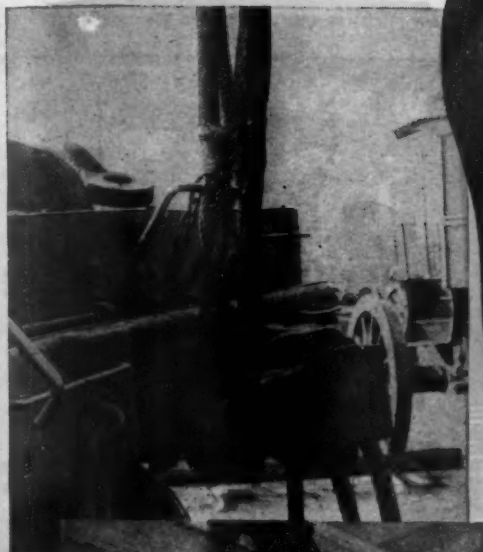
• DALLAS

• LOS ANGELES

• CLEVELAND

• BIRMINGHAM

RAILWAY MECHANICAL ENGINEER



RIGGERS' HAND BOOK FREE
Shows sling types, fittings,
capacities. Write for your
copy.

*PATENTS: U. S., 1,475,810, 1,534,671,
7,142,041, 2,142,042, 2,229,700,
CANADIAN, 552,874, 708,008



WHAT A GRIP!

**Handle shop and derrick lifts safely
with YELLOW STRAND BRAIDED SLINGS***

Scores of railroads have taken a fresh hold on the sling question as a result of wartime experience in shortening lay-up time. And what a grip *you'll* get by using Yellow Strand *Braided* Safety Slings in shops, yards, stores departments and on wreckers. Here you see such varied lifts as a steam locomotive, flat car (at the drawbar), main rod, pair of axles — and the list could include Diesel-electric bodies, motors, pistons, trucks, wheels, brake rigging assemblies and numerous other parts.

Tough Yellow Strand Wire Rope provides the strength in this efficient sling. The patented *braiding* adds flexibility, kink-resistance and a snug grasp on odd-shaped objects. The combined result is a time-and-labor-saving sling with less weight than chain of like capacity... with limberness well suited to Manila rope jobs... with greater security for men and loads.

Properly fitted, Yellow Strand *Braided* Slings will give long-lived, economical service. Write now for information. Broderick & Bascom Rope Co., St. Louis 15, Mo. *Branches:* New York, Chicago, Houston, Portland, Seattle. *Factories:* St. Louis, Seattle, Peoria.

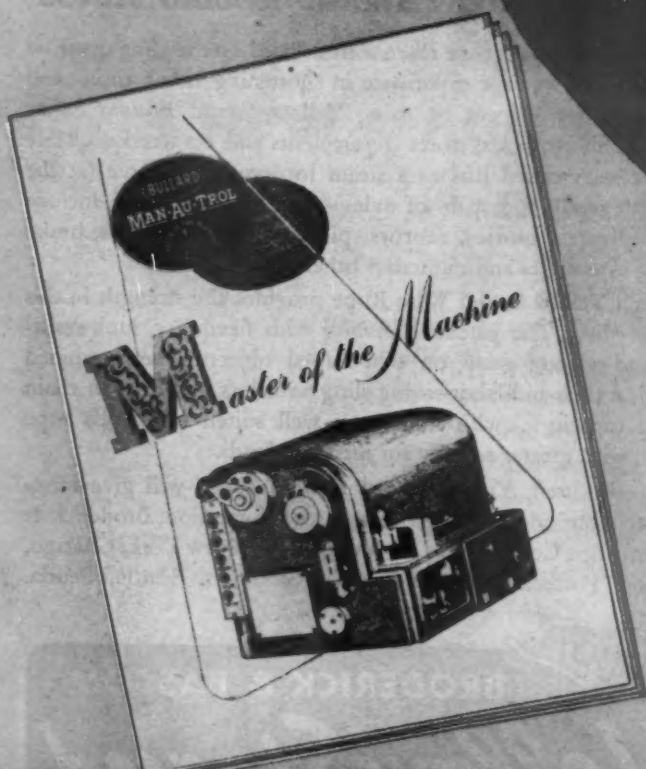


BRODERICK & BASCOM

Yellow Strand
BRAIDED SAFETY SLINGS

Prepare for the

Bullard
Cut Master
V.T.L.



Ask how a Man-Au-Trol
operated BULLARD Vertical
Turret Lathe will fit into
your picture. Request book-
let RM-MAN.

THE BULLARD
BRIDGEPORT

Post-War Era...

New Bullard Improvements Will Insure Lower Repair Costs



NOW is the time to line-up future cost reductions. The newer BULLARD machines offer the latest in machine tool economies.

BULLARD CUT MASTER Vertical Turret Lathes, made in 30", 36", 42", 54", 64" and 74" sizes, have produced sensational economies in many industries. Illustrations show two railroad shop installations—one a 30" unit machining rod bushings and the other, a 74" unit, boring tires.

Then there is the new BULLARD Man-Au-Trol V. T. L. This new unit does automatically any and every job (involving up to 39 functions of the main head and 39 additional functions of the side head) that a manually-operated Vertical Turret Lathe can do—and faster with a degree of accuracy no man can match. This applies for a run of numerous pieces of the same job. For single piece jobs—flick a lever and convert the machine to manual Vertical Turret Lathe operation without disturbing the setting for automatic cycle. When you're through with the one piece—flick the lever and reset your tools and you're back on production work. Find out more about this. Circular RM-MAN.



BULLARD COMPANY
CONNECTICUT



COST-CUTTER ON THE **BIG** JOBS

BULLARD CUT MASTER Vertical
Turner Lathes made in 30, 36,
42, 54, 64 and 74 sizes have
produced consistent economies in
many industrial installations—one
two railroad shop installations—
a 30" unit machining rod bushings
and the other a 74" unit, having

BULLARD
new

can also—this faster
of accuracy no man
a match. This applies for a fine

Here is a good example of how the Double-Housing Hy-Draulic Planer employs the obvious advantages of hydraulic actuation to reduce heavy duty planing costs. Photo shows this machine planing a 135" iron casting weighing about 10,000 lbs. Surfaces planed include two parallel guideways, each having three surfaces 6 feet long which are machined about 46" above the table top. Also planed are a center pad, a long narrow transverse rib and two large pads on the sides of the casting.

The Double-Housing Hy-Draulic Planer does this whole job in an average of 13 hours, floor-to-floor

time. Such results stem directly from the ability of Rockford Hy-Draulic machines to take more strokes per minute, remove more metal per hour.

As the size of the work-piece increases, so does the importance of the economies that the Double-Housing Hy-Draulic Planer can effect in your shop. These machines are made in four sizes: there's one to suit your requirements perfectly. Write for complete details today. Ask for Bulletin 1920.



4502

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



No matter what Paint Vehicle is needed...

- SYNTHETIC RESINS
- NATURAL RESINS
- MODIFIED SYNTHETICS
- DRYING OILS

RED LEAD'S

WIDE
COMPATABILITY

makes its Extra Rust Protection Available

The fact that Red Lead is generally accepted throughout industry as the standard metal protective paint indicates two things:

1. That it must be widely adaptable to various service conditions.
2. That it must offer something EXTRA in the way of rust prevention.

Red Lead's versatility is due principally to its compatability with the wide range of vehicles needed to answer present-day service demands. It can be used with practically every type of paint vehicle on the market—synthetic resins, natural resins, drying oils, and combinations of these.

Thus, paints for any metal protective purpose can be formulated with Red Lead. Since almost any paint vehicle can be used with Red Lead, a broad range of drying requirements can be met—anything from the normal drying primer used on structural steel to the quick-drying paint essential to present-day production schedules.

Why Red Lead means Extra Rust Protection

Red Lead has the property of counteracting acid conditions, recognized as accel-

erators of rust. In the presence of various acids, Red Lead forms insoluble lead salts at the approximate rate at which the acids are supplied.

This is true whether the acid originates from acid-forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust-inhibiting condition is maintained with a Red Lead paint.

Red Lead also forms an adherent protective shield which prevents electrochemical action, another prime cause of rusting.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.

No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

Write for New Booklet—"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas—ranging from Red Lead-Linseed Oil paints to Red Lead-Mixed Pigment-Varnish types. If you haven't received your copy, address nearest branch listed below.

All types of metal protective paints are constantly being tested at National Lead's many proving grounds. The benefit of our extensive experience with paints for both underwater and atmospheric use is available through our technical staff.



NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston, W. Va. (Evans Lead Division).

DUTCH BOY
RED LEAD

Fix this job the EASY way

with CHERRY BLIND RIVETS

WATCH YOUR STEP PLEASE

This damaged motor coach door was riveted by one workman from one side with Cherry Blind Rivets, saving time, labor, money and returning coach to running schedule with a minimum of lost time.

The easy way to do tough double-surface blind riveting such as this is with Cherry Blind Rivets. Because these rivets are upset with a pulling force, they work from one side of any structure, require only one workman, need no bucking.

Shear and fatigue values are comparable to solid rivets . . . generous material thickness and grip length tolerances make repair jobs easy, allow re-use of original holes without size drilling or reaming. There are self-plugging and hollow Cherry Rivets made in several head styles, diameters, grip lengths and metals . . . upset by easy-to-handle pneumatic or hand guns in tubes, bends, ducts and stringers. Cherry Rivets also work well in many new and unusual materials. Write now for more information.

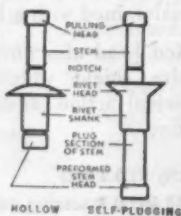
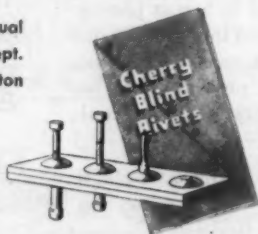


Photo shows workman upsetting Cherry Rivets in this job with G-10 hand gun shown above.

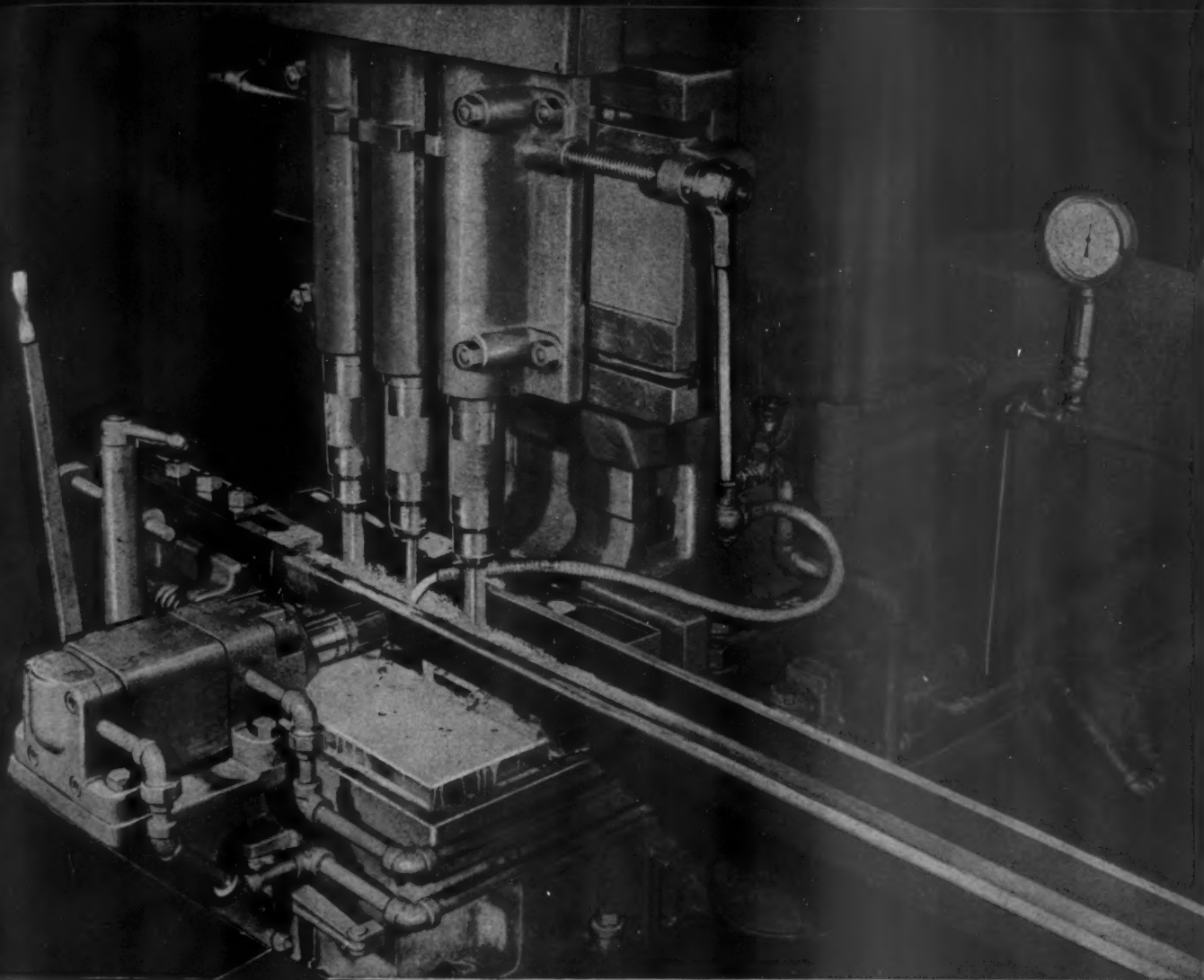
Finished job is strong, neat, durable, when done with Cherry Blind Rivets.

For more information, write for Manual D-45 and metal demonstration panel, Dept. A-277, Cherry Rivet Company, 231 Winston Street, Los Angeles 13, California.



CHERRY RIVETS, THEIR MANUFACTURE & APPLICATION ARE COVERED BY U.S. PATENTS ISSUED & PENDING

Cherry Rivet
Company
LOS ANGELES, CALIFORNIA



The New **SELLERS** RAIL DRILLING MACHINE

Compare It With the "Old Timers!"

SELLERS engineers were well acquainted with the many disadvantages of existing machines, so they started from scratch to design a drill which could cope with modern rail mill practice. The result of their efforts has been enthusiastically received wherever rail-drilling is an important operation.

SELLERS construction is simple, the parts strong and the spindles supported as close as possible to the work. Its gearing is unusually strong and mounted in oil-type casing on the top of the main housing. All gears are high grade forgings and run in oil. All shafts are mounted in anti-friction bearings... This type of drive requires no more attention than the rear axle of an automobile.

Saddle can be set to drill any thickness of rail, either automatically or hand operated... Minimum distance between spindles is 3½". Maximum, 12"... Designed also for elongated holes.

For complete technical data and delivery dates, write:

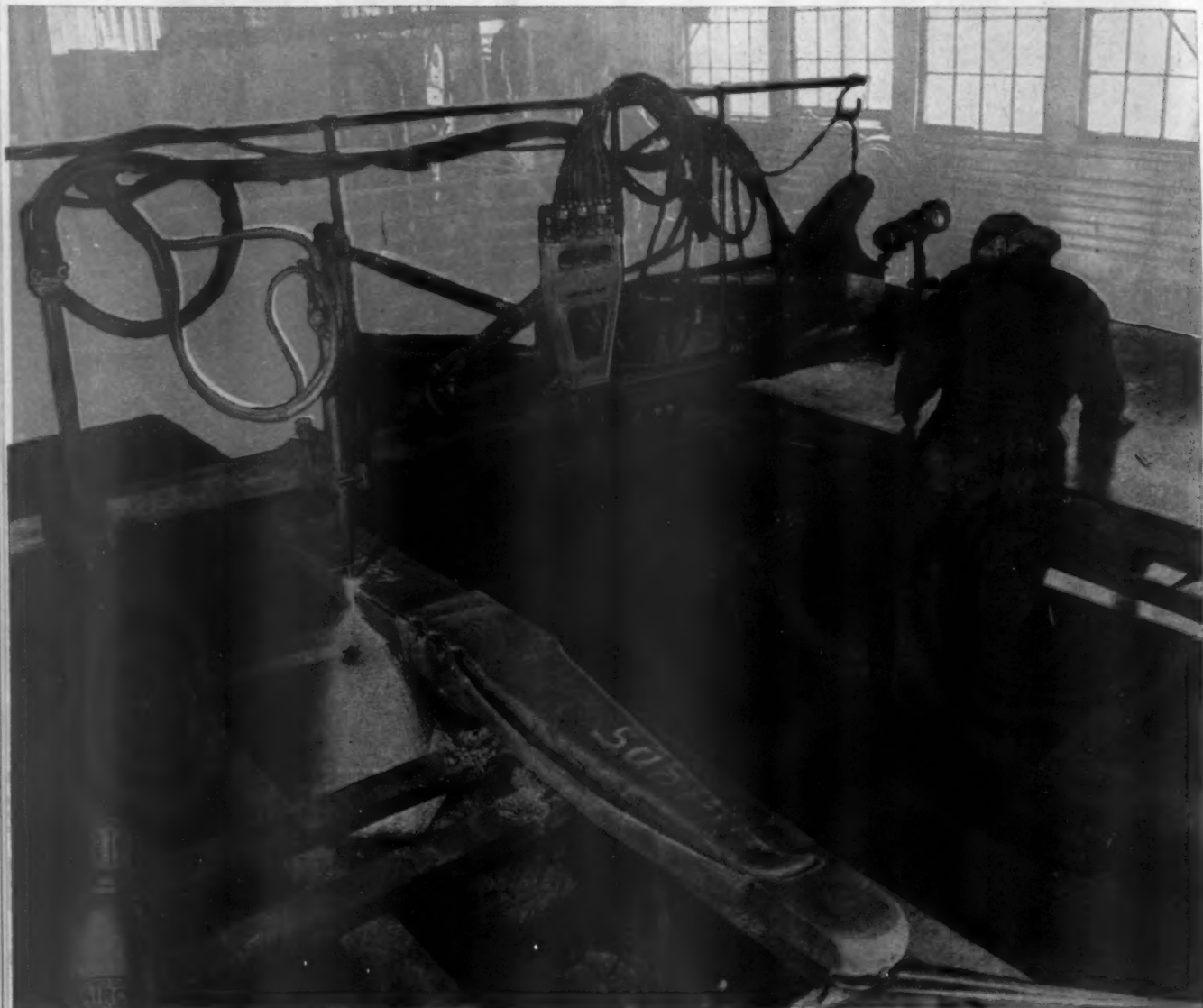
WM. SELLERS & COMPANY

1630 HAMILTON STREET • PHILADELPHIA, PENNA.

Precision Tools
Since 1848



Versatile Airco Processes



TO meet the critical problems caused by heavy wartime wear and the serious shortage of replacements, American railroads have stepped up shop activities to include a greater amount of fabrication and repair work than ever before. In carrying out this program, they have made extensive use of Airco oxyacetylene flame and electric arc processes, some of which are illustrated here.

Other Airco methods that are giving valuable aid to the railroads include: braze welding for repair of cast and malleable iron, hardfacing, silbrazing, hand cutting, flame hardening, and flame heating for straightening and bending. Airco's Applied Engineering Department will give full information and technical assistance on any of these modern metal-working processes. For complete details write the nearest Airco office, or Dept. RME at the New York address.

Machine Gas Cutting speeds the shaping of parts required for new railroad equipment and for replacement purposes. Here a rough forged trailer truck equalizer is being shape-cut on an Airco Travograph. The tracing device guided by the operator controls torch movement.

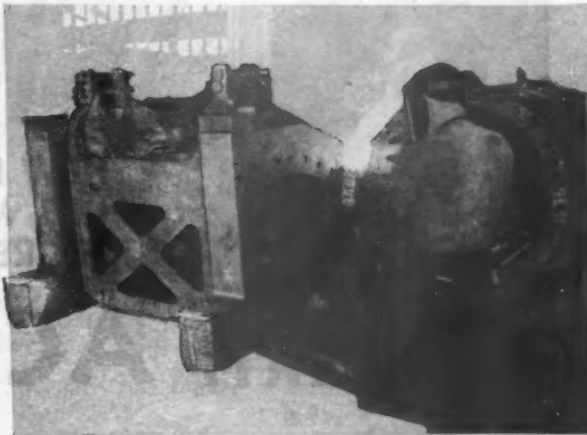


Save Shop Time and Cost



Oxyacetylene Welding helps to repair damaged parts quickly and economically. This operator is welding new return bends onto a superheater unit.

Arc Welding has won widespread acceptance among railroad men for the fabrication of many locomotive and car parts. This photo shows a new frame section being welded to a cast steel locomotive cylinder. Front end of frame is beveled for welding onto main frame section.



Flame Descaling quickly removes furnace scale from forgings like these locomotive side rods. This method causes adhering scale to "pop off" without scratching or marring the metal surface.



Flame Gouging is used in modern railroad shops for removing defective welds and surface cracks. Here a crack in a car coupler is being "veed" out prior to welding — a cost saving reclamation method which has been authorized to help the railroads meet war conditions.



Pipe Welding by either the oxyacetylene flame or electric arc method makes strong, leakproof joints in steam, water and other piping systems.

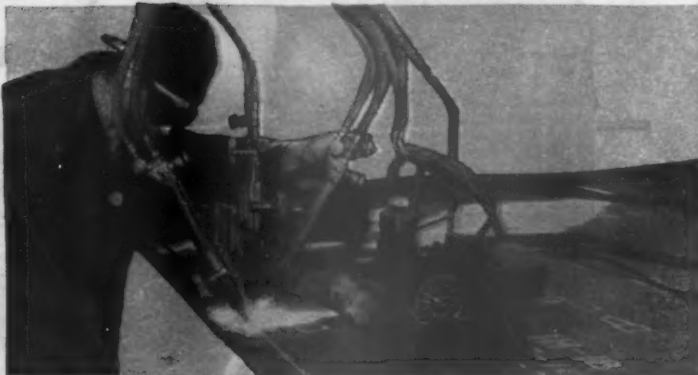


Plate-Edge Preparation saves time in preparing parts for welded fabrication. Small, portable machines like this Airco Radiograph are ideal for preparing heavy plate for welding with maximum speed and accuracy.



AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities



**NEW HEAVY TOOLS
GIVE MORE RIGIDITY
AND GREATER RANGE TO**

CINCINNATI **ACME** TURRET LATHES

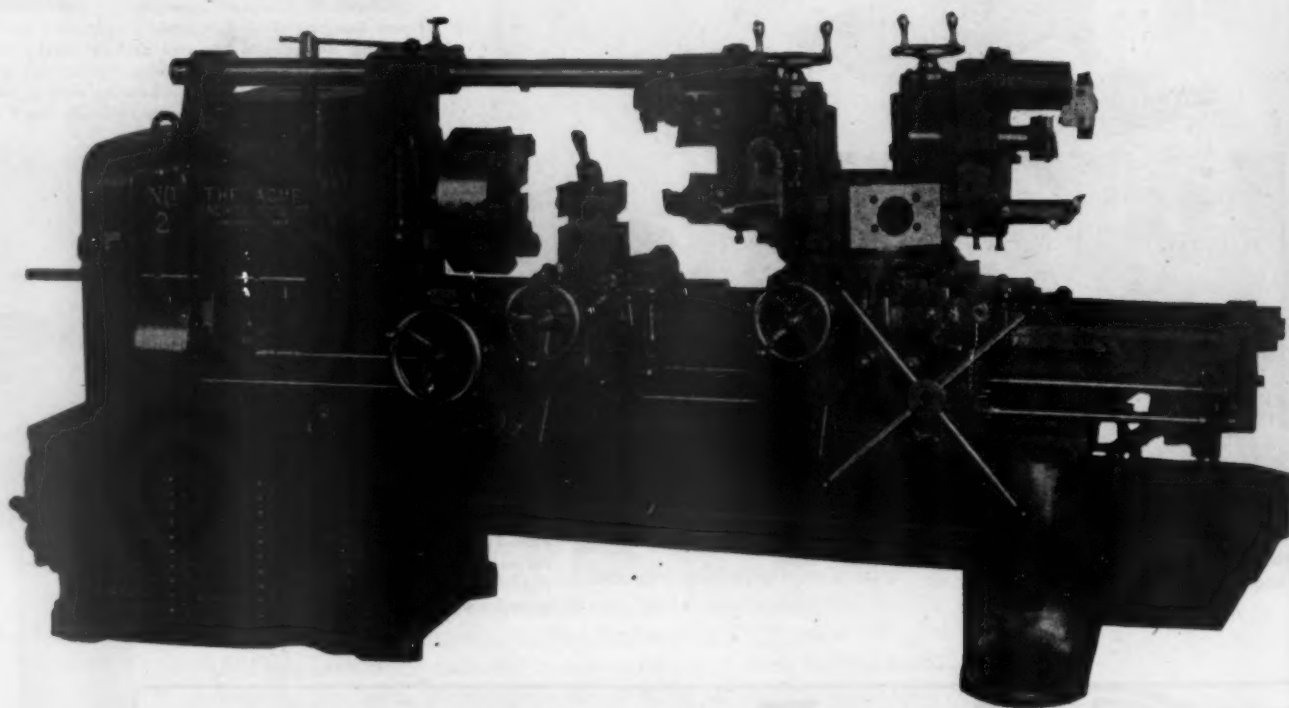
FROM bed to tool post all Acme Turret Lathes are built to provide the power, speed and precision necessary for modern requirements.

Acme engineers have also made another important contribution to the progress that is being made with cemented carbide cutting tools — they have developed a **NEW LINE OF MASSIVE TOOL HEADS AND HOLDERS** which assure maximum rigidity and range of performance.

From left to right the above illustration shows an adjustable multiple turning head which takes its support on a rigid heavy stationary bar mounted on headstock — five heavy tool holders of the straight and angular types and a standard heavy duty multiple turning head with fixed center holes for holding the cutter heads.

In other words, every component on an Acme Turret Lathe is designed to withstand anything you wish to machine with modern cutting tools.

OUR ENGINEERS ARE AT YOUR SERVICE



The **ACME**

**MACHINE TOOL CO.
...CINCINNATI, OHIO.**

Car Wheel Demounting Records

40 Seconds

Floor - to - floor

72 Seconds

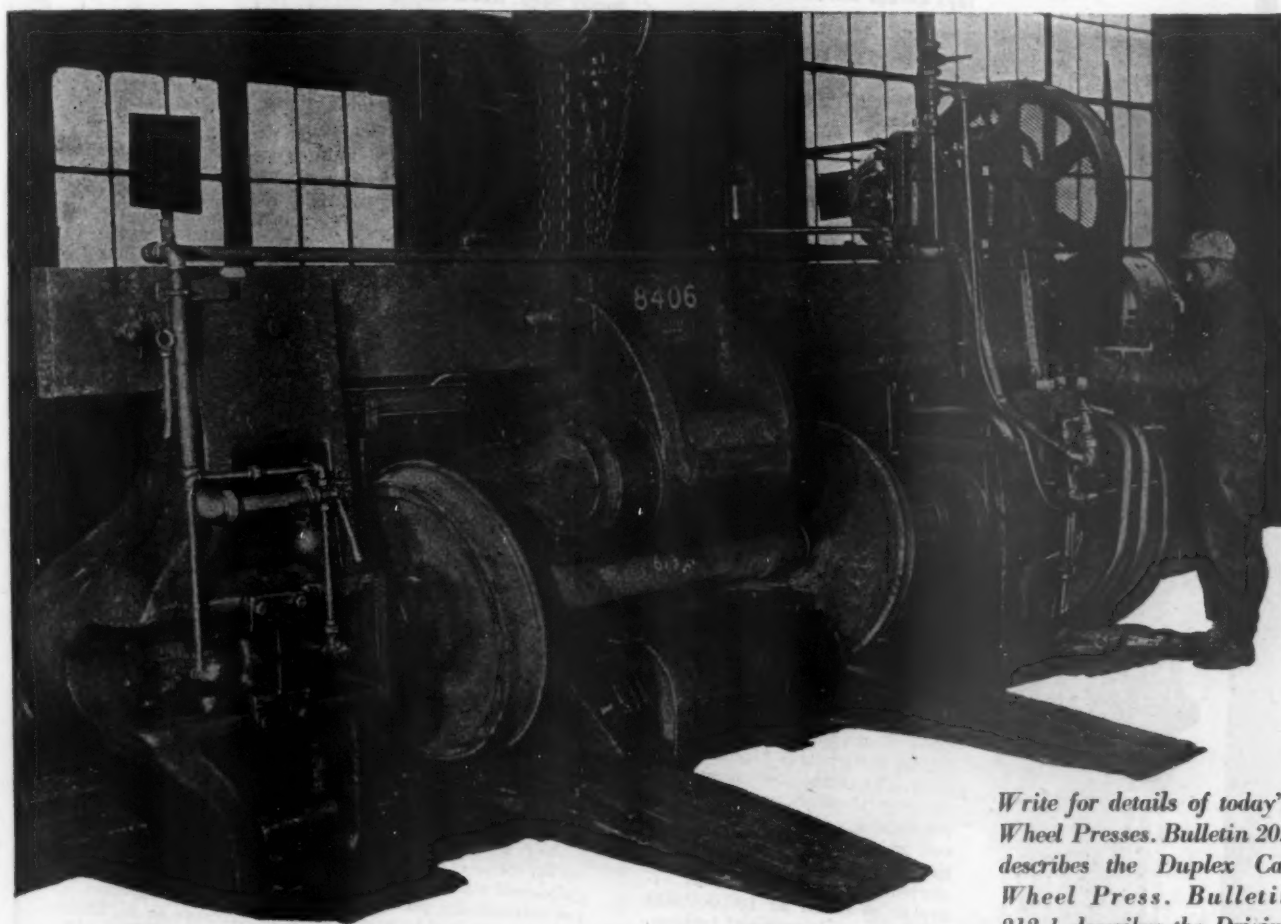
for Mounting

Chambersburg Wheel Presses have established records in railroads shops all over the country for the speed with which they permit the rapid mounting or demounting of wheels. On the car wheel presses, records have been made for demounting wheels as low as 40 seconds per

wheel floor-to-floor—mounting time as rapid as 72 seconds.

These presses have been designed and improved with the needs of the railroad shop constantly in mind—the necessity for speed in getting car wheels back in service has been paramount.

(Below) Chambersburg Duplex Car Wheel Press in shops of L. & N. R. R.



Write for details of today's Wheel Presses. Bulletin 202 describes the Duplex Car Wheel Press. Bulletin 212-1 describes the Driving Wheel Press.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



CHAMBERSBURG
HAMMERS · CECOSTAMPS · PRESSES

How

6 ENEMIES of METALS

are being defeated in typical uses by Inco Nickel Alloys



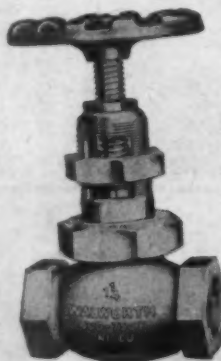
ABRASIVE SCALE particles hammer at the seats of blow-off valves... corrosive and erosive hot waters add their destructive force. Yet the first Monel trim on a T.Z. valve used by the New Haven was still in service after 12 years! A recent count showed 272 of 331 New Haven locomotives equipped with Monel-trimmed T.Z. valves. A New Haven executive writes "...The Monel seats have given very satisfactory service... very few have been renewed..." **INCO Nickel alloys defeat abrasion.**



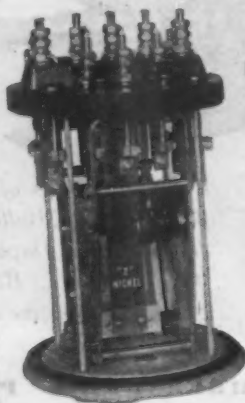
EROSIVE STEAM, direct from the locomotive boiler, blasts with full force at the inner cylinders of steam separators, often causing failure in as little as 3 months. Over 4 years ago, the Dri-Steam Products Co. fabricated a new-type separator of Monel. Since then, with more than 300 in service, not one Monel separator has failed! In addition to long life, the Monel separator costs 30% less... weighs only half as much as separators made of the metal formerly used. **INCO Nickel alloys defeat erosion.**



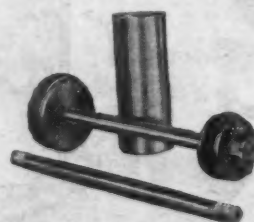
CORROSIVE WATERS cannot harm the fine (.006") wires that form the Knit Metal Mesh feedwater filters used by the Vermont Central R. R. The 14" x 20" pads provide 15,000 square inches of filtering surface with a million meshes to snare dirt, scale and oil from the feedwater. They are easily cleaned with steam or any ordinary solvent... resist breakage and corrosion because they are knit of strong, tough, corrosion-resistant **MONEL**. **INCO Nickel alloys defeat corrosion.**



TEMPERATURES TO 750° F.... more than 200° F. beyond the limit usually considered reasonable for bronze valves... and pressures to 400 psi. had to be handled by valves in Burlington Engine No. 3012, built in 1935. Walworth built valves with all-Monel bodies were installed. Now, after more than 1,150,000 miles of service, the majority of the original Monel valves are still at work. Burlington states: "Monel valves are one of the few foolproof parts of a locomotive." **INCO Nickel alloys defeat high temperatures.**



FATIGUE... 100,000,000 flexings a year must be withstood by the spring pendulum used in the Code Transmitter built by the Union Switch and Signal Company. The transmitter, operating directly through track rails to wayside signal, engine cab signal, or both, shows traffic conditions on the trackage under its control. The spring which vibrates as much as 100,000,000 times a year is made of fatigue-resistant "Z" Nickel. In years of service, not one "Z" Nickel transmitter spring has worn out. **INCO Nickel alloys defeat fatigue.**



HEAVY STRESSES, corrosive gases and abrasive grit gang up on locomotive boiler feed pumps. Sending 110 to 200 gallons of water into the boiler at a rate of 74 to 80 strokes per minute, the pump must withstand heavy stresses. The rods are exposed to grit, sleet and corrosive gases. Linings must retain a smooth highly polished surface. Since 1922, Worthington Pump & Machinery Co. has been making vital parts of these pumps from Monel. **INCO Nickel alloys defeat heavy stresses.**

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

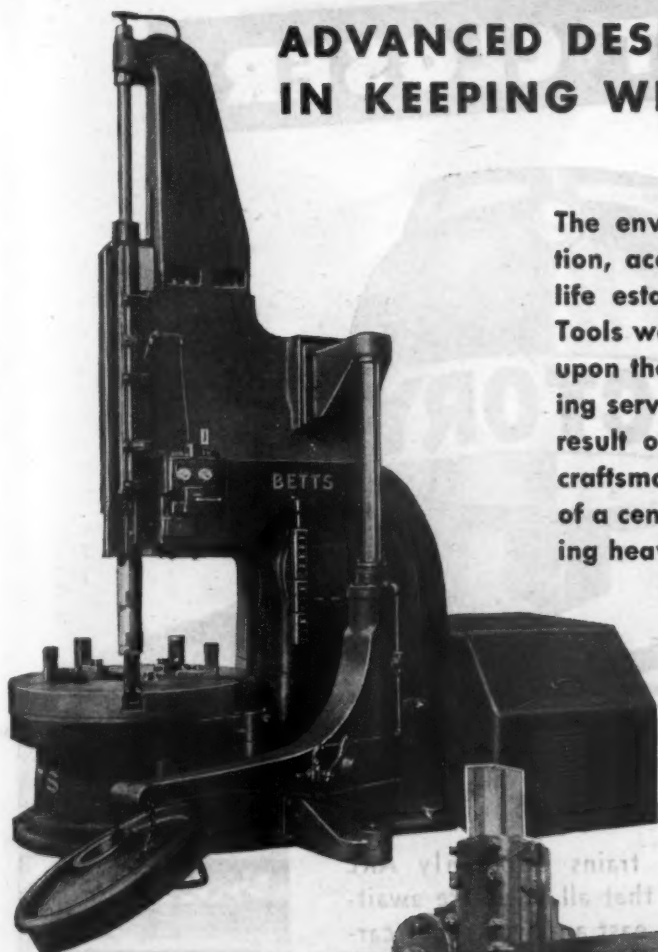
NICKEL INCO ALLOYS

MONEL • "T" MONEL • "S" MONEL • "H" MONEL • "K" MONEL • INCONEL • "Z" NICKEL • NICKEL • Sheet... Strip... Rod... Tubing... Wire... Castings... Welding Rods (Gas & Electric)

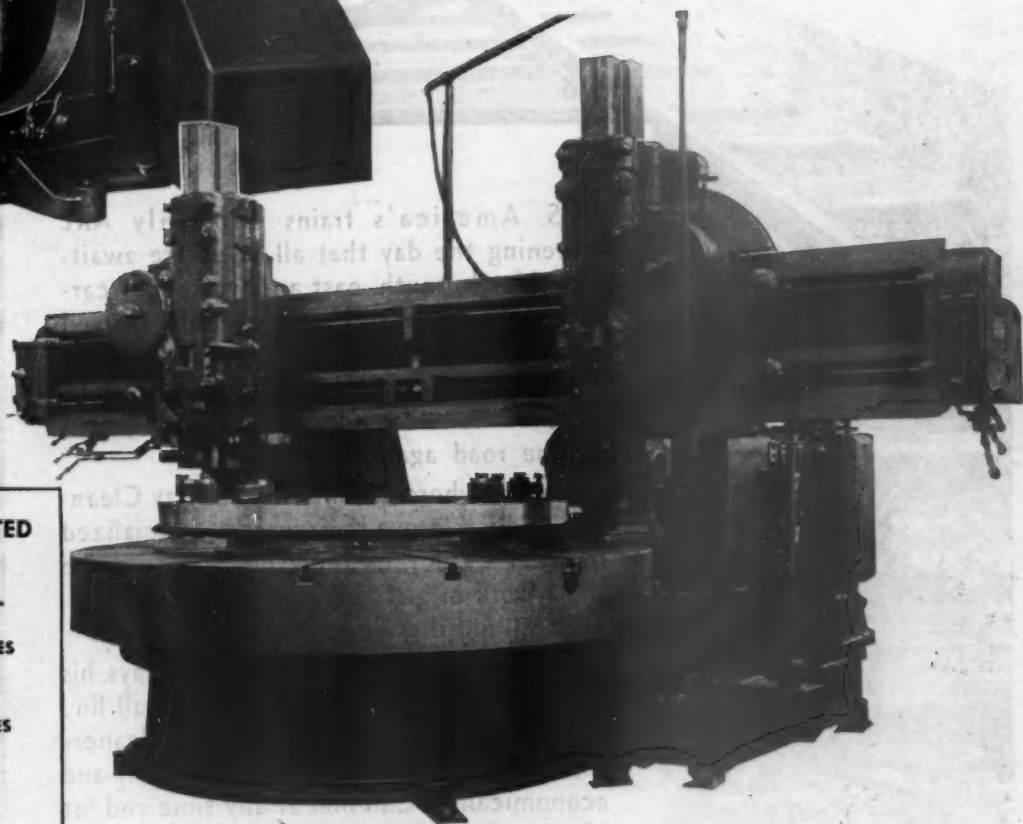
CONSOLIDATED RAILROAD SHOP TOOLS

ADVANCED DESIGN AND CONSTRUCTION IN KEEPING WITH RAILROAD PROGRESS

The enviable reputation for stepped-up production, accurate performance, and long productive life established by Consolidated Railroad Shop Tools was not earned over night. It has been built upon their record of years of continuous, satisfying service in hundreds of railroad shops . . . the result of seasoned engineering skill and expert craftsmanship supported by nearly three quarters of a century of experience in designing and building heavy machine tools.



**BETTS
HYDRAULIC FEED
CAR WHEEL
BORER**



BETTS 112" HEAVY DUTY TIRE MILL

OTHER CONSOLIDATED RAILROAD SHOP TOOLS INCLUDE—

CENTER DRIVE AXLE LATHES
END DRIVE AXLE LATHES
JOURNAL TRUING LATHES
PROFILE MILLING MACHINES
SLAB MILLING MACHINES
ROD MILLING MACHINES
DRILL PRESSES
CRANK PLANERS
ROD BORING MACHINES
CYLINDER BORING MACHINES

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN



CONSOLIDATED

MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

BRINGING IT CLOSER



YES, America's trains certainly ARE hastening the day that all of us are awaiting. North, south, east and west, they carry their loads of vital war materials. Speed is the word of the day—and that means that there must be no delay in putting cars, locomotives and tenders in shape to go out on the road again.

Here is where Wyandotte Railway Cleaning Products prove their worth. Specialized to meet **EVERY** cleaning need, they make short work of grit and soot, grease and carbon, oil and dirt deposits.

The Wyandotte Representative plays his part in time-saving, too. He has a full line of maintenance and back-shop cleaners that will do the toughest job efficiently and economically. Call him at any time and let him put his products to work for you.



Wyandotte

Reg. U. S. Pat. Off.

WYANDOTTE CHEMICALS CORPORATION
J. B. FORD DIVISION - WYANDOTTE, MICHIGAN
SERVICE REPRESENTATIVES IN 88 CITIES



FOR BETTER TAPER *Turning*

... a better **TAPER** *attachment...*

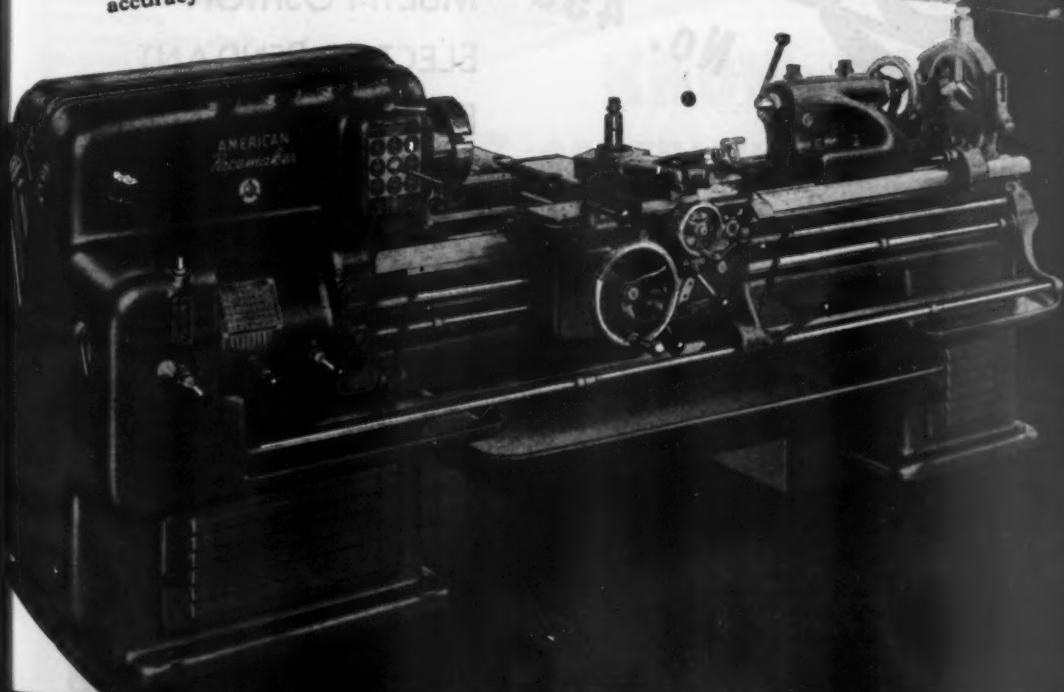
A brand new—greatly improved Ball Bearing Taper Attachment is now available for all sizes of "American" Pacemaker Lathes.

This new Attachment contains 24 permanently sealed ball bearings which reduce friction to an absolute minimum.

All ball bearings ride on hardened and ground steel "ways" thus insuring maintenance of accuracy and a minimum of wear.

All bearings are concealed so they are never exposed to chips and dirt. Cumbersome dirt guards are therefore unnecessary.

The new "American" Ball Bearing Taper Attachment is the very latest development in Taper Attachments and offers an anti-friction construction that is practical, effective and that will retain its original accuracy for a long period of time.



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills



No. 4536

MULTI-POSITION
ELECTRIC PENDANT
DIRECTIONAL CONTROL

Just Installed In A Large Locomotive Shop

THIS new LUCAS Horizontal, Boring, Drilling and Milling Machine is boring one of two holes on a Duplex Stoker Transfer Hopper. The job is chucked on a 36" x 48" Rectangular Swiveling Table which is graduated to read in half degrees of arc and provided with elevating ball thrust bearing to facilitate swiveling. The second hole on this stoker part will also be bored at the same setting on the LUCAS, with

the table swung 37° from the centerline of the first bore.

The ever-increasing weights of many locomotive parts and their awkward shapes, plus the higher standards of maintenance which require greater precision, make the LUCAS one of the most vital machines installed in a railroad shop.

When you mount a job on a LUCAS, you save set-up time as well as machining time.

LUCAS MACHINE TOOL CO.
CLEVELAND, OHIO

CAMERON PUMP OPERATORS' DATA

TABLE OF CONTENTS

Definitions and formulae

Principle of a centrifugal pump
Viscosity
Specific gravity
Velocity
Pumping terms
Suction limitations
Work performed in pumping
Friction losses in pipe
Symbols

Tables

Water data
Pressure of water
Mercury column conversion
Friction in pipes
Friction in pipe fittings
Data on various liquids
Baume scales
Friction of paper stock
Electrical data
Conversion tables
Decimal equivalents
Temperature conversion
Area of circles
Pipe fitting dimensions
Pipe flanges
Pipe data
Hardness conversion
Pump fittings

Installation

Starting and operation

Maintenance

Operation difficulties

Priming methods

Bearings and lubrication

Stuffing box arrangements

Packing

KNOW-HOW BOOK

for

CENTRIFUGAL PUMP USERS

This book, CAMERON PUMP OPERATORS DATA, was prepared to help operating men take better care of their centrifugal pumps and to aid in solving the everyday problems that arise.

All ten chapters are packed with useful operating and maintenance data—170 pages of know-how. Its size, 4½"x7¼", fits a pocket and its durable fabricoid covering will stand years of hard use.

If you can make use of information on the subjects shown in the table of contents, we will be glad to send you a free copy. Please request it on your company letterhead. Ingersoll-Rand Company, Cameron Pump Division, 11 Broadway, New York 4, N. Y., or any branch office.

Ingersoll-Rand

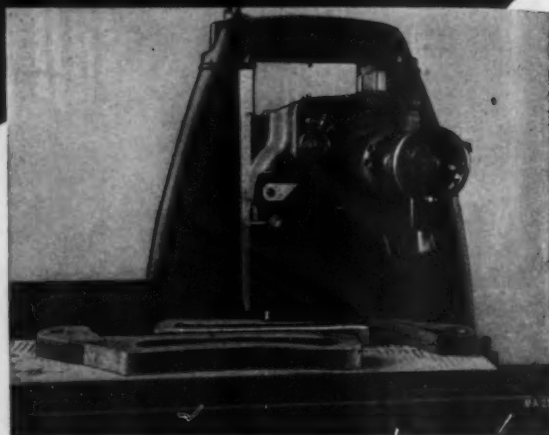
11 BROADWAY, NEW YORK 4, N. Y.
CAMERON PUMP DIVISION

SIDE RODS, LINKS, GUIDES, VALVES, ETC. PRECISION GROUND WITH MATTISON SURFACE GRINDER



Locomotive side rods are accurately ground on Mattison Grinder. Grinding provides a flat surface for locating boring operations and permits checking alignment of rod while on locomotive.

Increased speed of present day locomotives has made it imperative that moving parts be finished to close limits of accuracy. Illustration shows links being ground on Mattison Grinder.



● The Mattison High-Powered Precision Surface Grinder can be used to advantage by railroad shops to speed up the finishing or reconditioning of parts to closest accuracy with fine finish. The Mattison Grinder has the high power and built in ruggedness required for rapid, heavy duty removal of metal. It also has the precision necessary to produce fine high quality finish and accuracy to the closest limits. Jobs ground with narrow wheels on small light machines or finished by other methods can be ground several times faster and with greater accuracy on the Mattison. The large size and capacity permits

ADDITIONAL INFORMATION



Also available is free Set-Up Book showing further examples of work ground on Mattison Grinders — Send for a copy today.

grinding one large part weighing up to several tons in weight or many small parts with equal speed and facility. Pictures show a few of the many jobs Mattison Grinders are capable of handling for railroad shops. For complete information send for free circular. Table sizes range from 12" to 36" wide to 192" long.



CROSSHEAD GUIDE



MAIN CROSSHEAD GUIDE

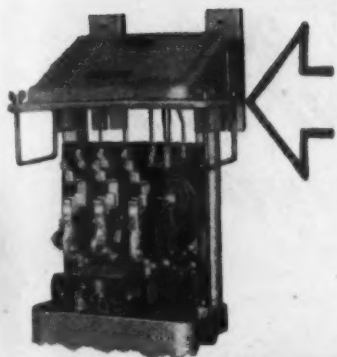


VALVE CROSSHEAD GUIDE

MATTISON

MACHINE WORKS

ROCKFORD • ILLINOIS



PROBLEM: To find a durable cable for oil-immersed, motor-control connections

FIRST SOLVED WITH FLAMENOL CABLE

Eight years ago, a Virginia chemical plant faced a troublesome cable problem. The plant required insulated cable for oil-immersed, motor-control connections. Rubber-insulated cable deteriorated rapidly in the oil, and frequent replacement was necessary.

When this problem was given to the General Electric Company, G-E engineers recommended the use of Flamenol* cable. In a trial installation, Flamenol proved so successful that the customer decided to use it throughout his plant.

If you have a problem of finding insulated cable or wire that will withstand severe conditions, such as contact with oil, Flamenol may very likely be the answer. It has proved its many desirable properties in hundreds of power and lighting applications.

RESISTS FLAME

Flamenol does not support combustion—thus it prevents serious outages due to fires that involve wiring. Requiring no protective braid, it reduces the volume of wiring and eliminates terminating problems due to fraying. Flamenol strips easily and leaves the conductor surface untarnished. It is highly resistant to oils, water, mild acids and alkalis, and weather. It is tough, stable, flexible at low temperatures, and has high dielectric strength.

A G. E. "FIRST"

Only G.E. makes Flamenol wire and cable. Plasticized polyvinyl chloride, the insulation on Flamenol, was pioneered by G.E. and introduced in 1935—not as a "substitute"

for rubber insulation, but as a new type possessing desirable properties not available in rubber. To find out how Flamenol can help solve your problems—save you time, trouble, and expense—ask our local office, or write General Electric Company, Schenectady 5, N. Y.

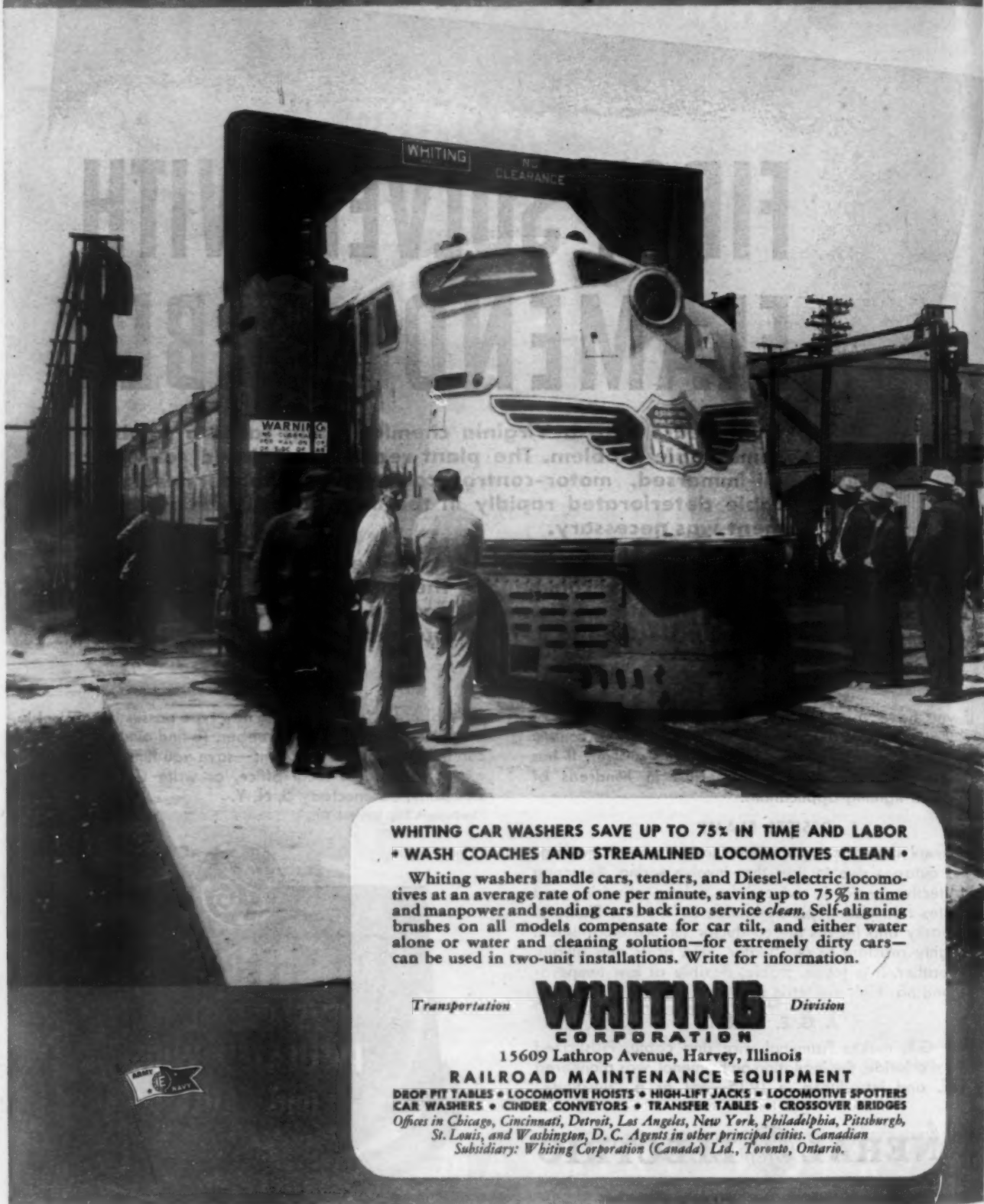
*Trade-mark Reg. U.S. Pat. Off.

GENERAL  ELECTRIC

Buy all the BONDS you can—and keep all you buy



Don't Cars Cleaned While You Wait —AND AT 100 FEET PER MINUTE



**WHITING CAR WASHERS SAVE UP TO 75% IN TIME AND LABOR
• WASH COACHES AND STREAMLINED LOCOMOTIVES CLEAN •**

Whiting washers handle cars, tenders, and Diesel-electric locomotives at an average rate of one per minute, saving up to 75% in time and manpower and sending cars back into service clean. Self-aligning brushes on all models compensate for car tilt, and either water alone or water and cleaning solution—for extremely dirty cars—can be used in two-unit installations. Write for information.

Transportation

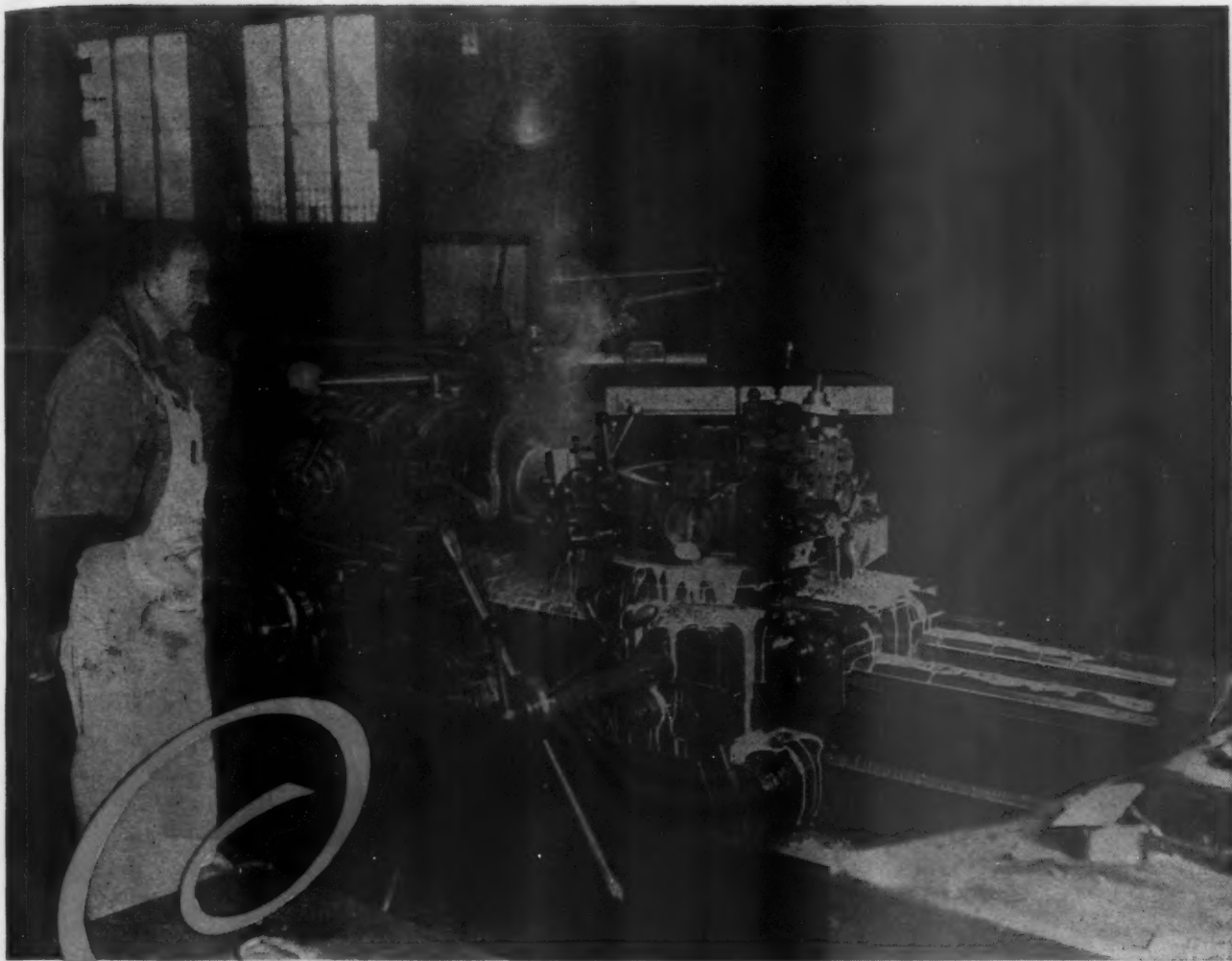
WHITING
CORPORATION

Division

15609 Lathrop Avenue, Harvey, Illinois

RAILROAD MAINTENANCE EQUIPMENT

DROP PIT TABLES • LOCOMOTIVE HOISTS • HIGH-LIFT JACKS • LOCOMOTIVE SPOTTERS
CAR WASHERS • CINDER CONVEYORS • TRANSFER TABLES • CROSSOVER BRIDGES
Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh,
St. Louis, and Washington, D. C. Agents in other principal cities. Canadian
Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario.



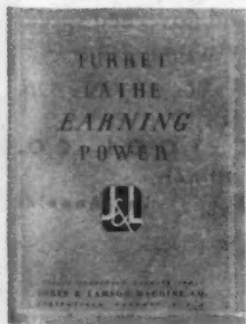
Economy starts with *modernization*

To Modernize, with Jones & Lamson Universal Turret Lathes, is to Economize.

All the essentials for fast, economical turret lathe production are built into these machines. Rigidity, Speed, Power and Ease of Operation are combined in them to take full advantage of modern fast-cutting tools with minimum fatigue to the operator.

A complete line of Universal Turret Lathes, with from 1½ inches to 8 inches bar capacity, is available for railroad maintenance and shop requirements.

Our book, Turret Lathe Earning Power, will tell you more about the productive advantages of these machines, and will be sent to you upon request.



JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

TOP-SPEED MAINTENANCE IS

EASIER



Reaming holes in steel shafts for freight car slides.

with

Thor
AIR
DRILLS

Why Thor Air Drills Maintain Constant Speed Under Varying Loads.



Thor's exclusive, patented "Air Behind the Blades" principle assures instant starting, prevents dead center positions and provides full use of air pressure. Solid-one-piece construction of rotor steps up power performance under all conditions and increases the useful life of the tool.

... POWER and STAMINA FOR HEAVY DUTY

Thor Air Drills meet every need of shop or section for fast, accurate maintenance work . . . In every size from the biggest heavy-duty machine to the smallest high-speed unit they are compactly built and easy to handle—this means faster, easier work. For drilling, tapping and reaming, Thor Air Drills offer every advantage—top power, light weight, perfect balance and instant starting—plus smooth, steady operation under load, lack of vibration and governed speeds—all vital factors in dependable, low-cost operation.

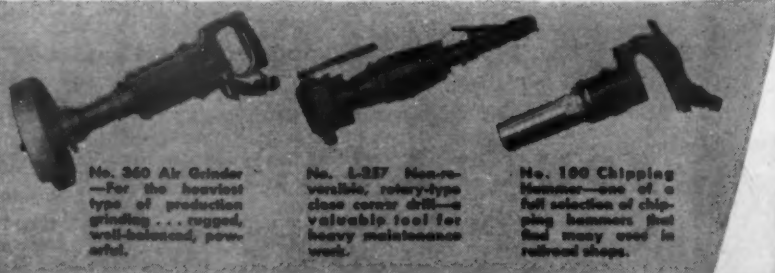
For full information, write for Thor Pneumatic Tool Catalog No. 52B.

INDEPENDENT PNEUMATIC TOOL CO.

600 W. Jackson Blvd., Chicago 6, Illinois

New York

Los Angeles



No. 360 Air Grinder
—For the heaviest type of production grinding . . . rugged, well-balanced, powerful.

No. L-257 Non-reversible, rotary-type close center drill—a valuable tool for heavy maintenance work.

No. 100 Chipping Hammer—one of a full selection of chipping hammers that find many uses in railroad shops.

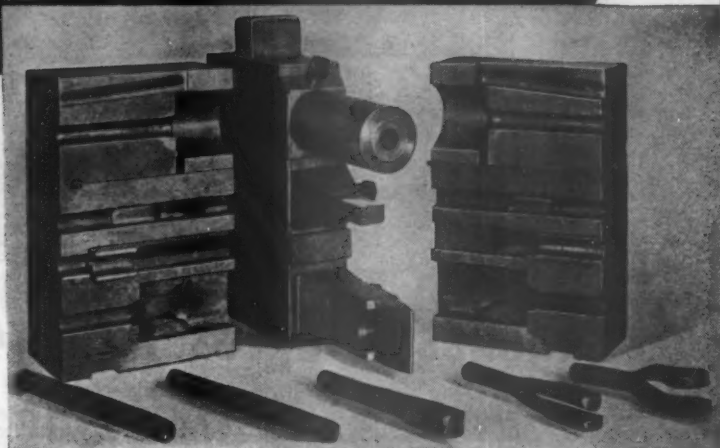
For Fast Economical Production of Jaw Forgings



Ajax Forging Machines are of exceptional value in the production of a wide range of jaw forgings, particularly so on the ends of long rods.

In some instances, with a small size upsetter, the end of the bar is simply balled up or gathered for subsequent drop forging of the jaw in a hammer or forming in a forging press.

Where the size of the machine is ample and the jaw design suitable, it can be completely forged in the upsetter in dies similar to those illustrated. After gathering, the stock is split by the action of the die slide by closing with suitable splitting knives carried in the gripper die. After that the jaw is brought to finished form by a final upsetting operation.



Jaw Forging Dies with Progressive Forging Operations.

As a third method, where production does not warrant outlay for the somewhat complex dies with slitting knives or where the jaw is large in relation to the size of the forging machine, the slitting operation can be performed on an Ajax Hot Sawing and Burring Machine or with a cutting torch.

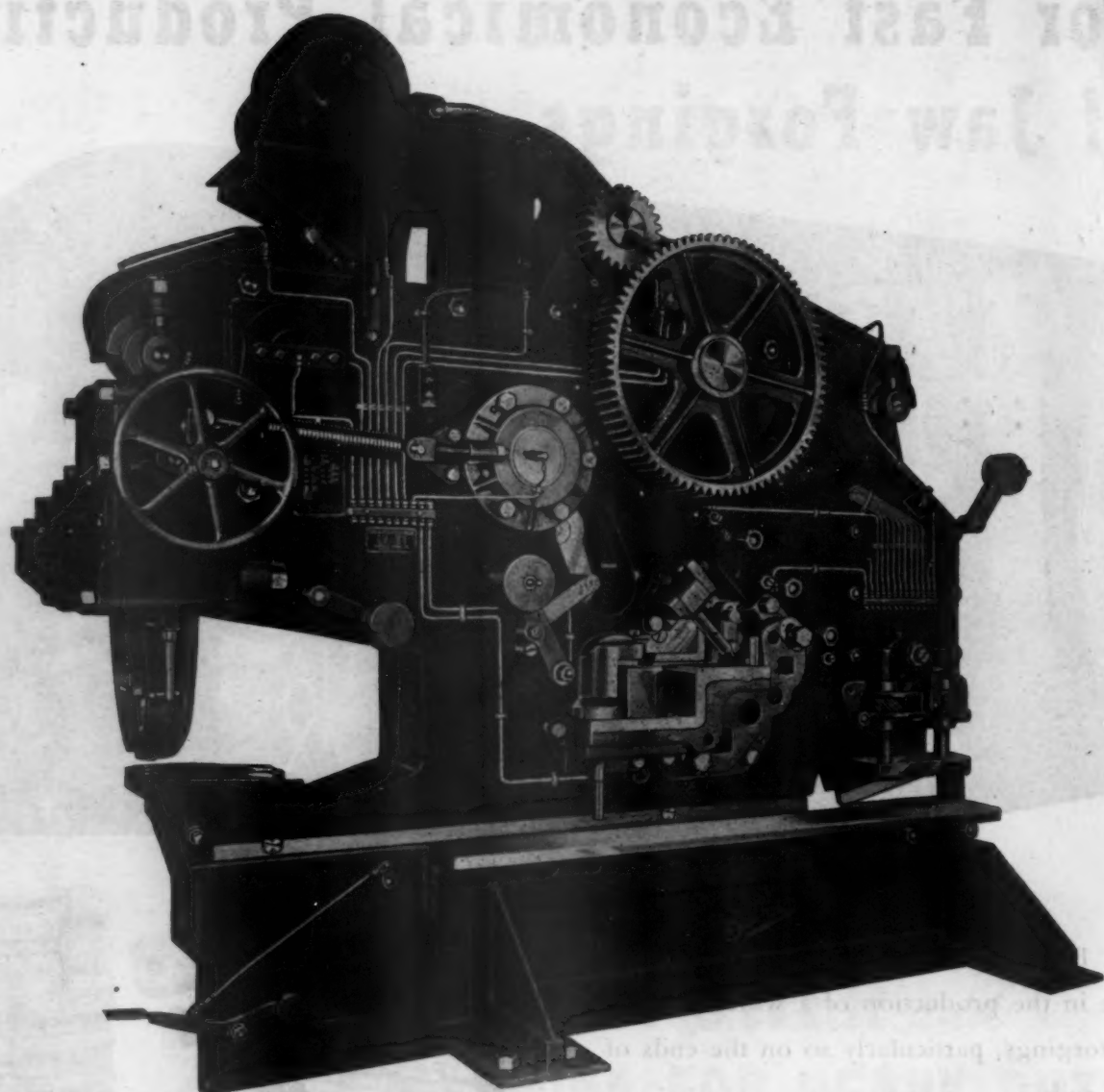
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AJAX

MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

621 MARQUETTE BUILDING • CHICAGO 3, ILLINOIS



**Punches 1 9/16" x 1 1/4"; cuts 6" x 7/8" Angles
3" Rounds, 2 5/8" Squares - Shears 1 1/4" Plates**

... Where work like that listed above is to be done, the Buffalo No. 4½ U. D. Machine shown here is the answer. Steel shops, railroad maintenance shops, steel mills and many other heavy industry shops find that Buffalo U. D. Machines speed up their production greatly.

COMPLETE DETAILS CONTAINED IN BULLETIN 360A

BUFFALO FORGE COMPANY

174 MORTIMER STREET

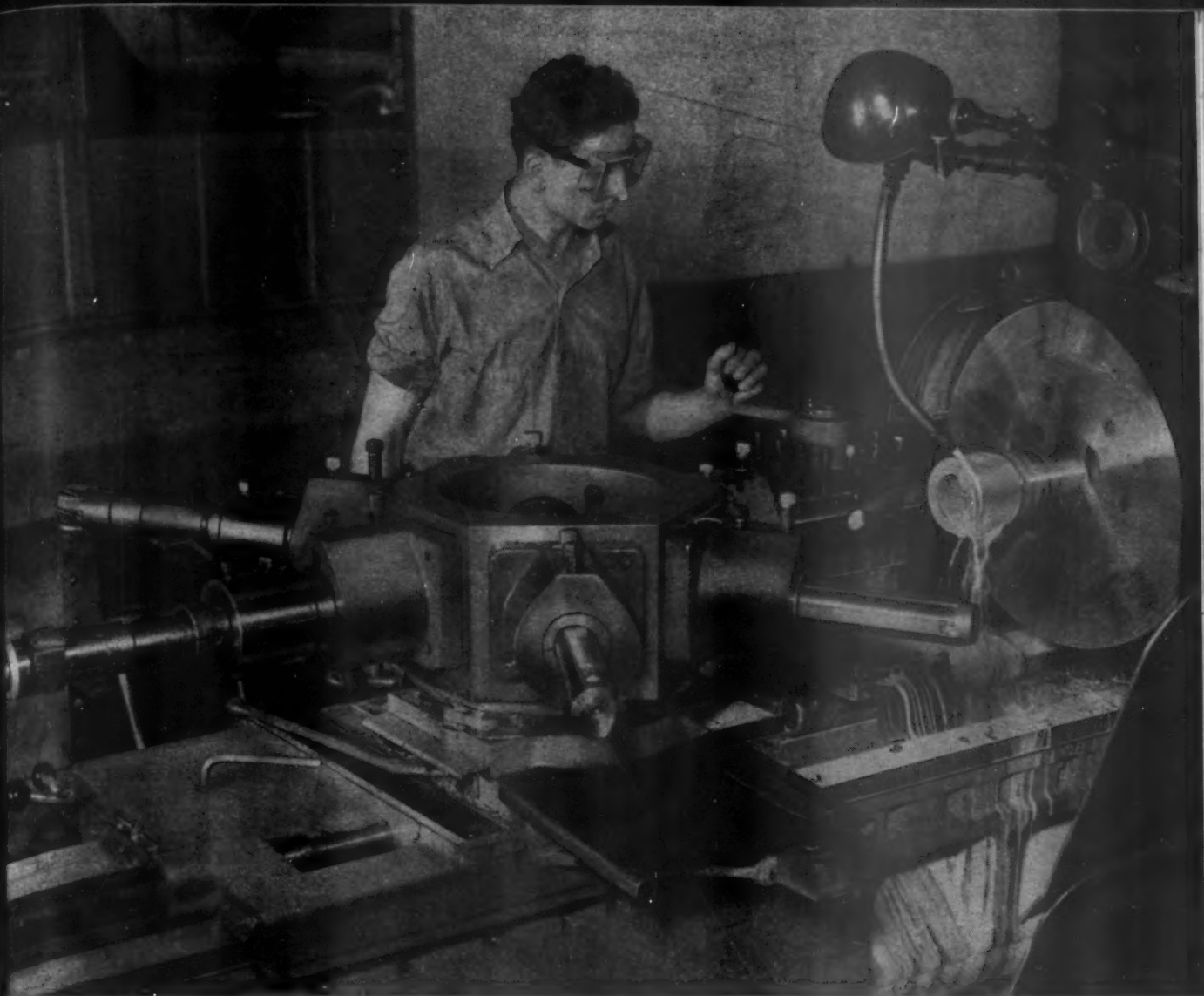
BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



COMBINATION PUNCHES

Shears and Bar Cutters



AN IMPORTANT ADVANTAGE...on both large and small lots!

GISHOLT'S CROSS-FEEDING HEXAGON TURRET gives you a more versatile machine—enables you to perform a number of cutting operations on the face or interior of the work piece while the outside diameter is being turned by the square turret. It permits you to make more use of multiple cutting. Tool investment is reduced, set-up time is shortened for a wide variety of work.

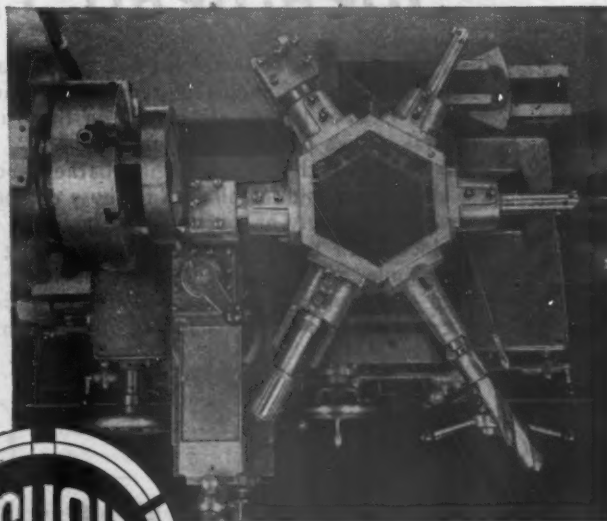
On small lot jobs, the Gisholt cross-feeding hexagon turret is particularly useful. Plain forged cutters, simple tool holders and single-point stub boring bars can be used for boring, facing, recessing, etc., where small numbers of parts do not justify elaborate, multiple tooling set-ups.

Sixteen power feeds with adjustable feed trips are provided for both cross and longitudinal feeds. Direct reading plate on the feed lever shows feeds in thousandths of an inch. These are engaged or disengaged by quick releasing levers. Write for literature.

GISHOLT MACHINE COMPANY

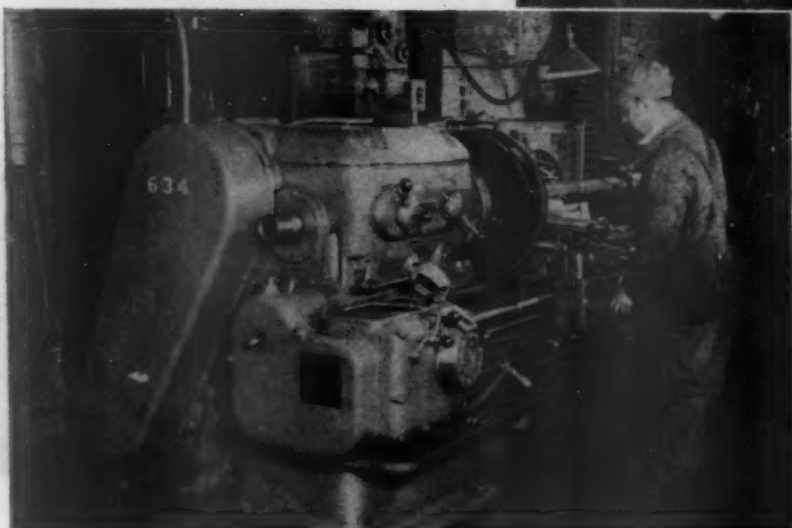
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Look Ahead . . . Keep Ahead . . . With
Gisholt Improvements in Metal Turning



The cross-feeding hexagon turret can be furnished instead of the fixed-center turret in all five sizes of Gisholt Saddle Type Turret Lathes. It can be firmly positioned on center line for large lot production with multiple tooling and pilot bars the same as any fixed-center machine.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



On the RAILROAD FRONT

Spearhead The Production Drive

SPEED and precision, plus exceptional adaptability to locomotive shop requirements, characterize the part L. & S. Lathes are playing in the drive to keep vital motive power on the road.

The 14 inch L. & S. Engine Lathe (above) is the ideal all-around installation for busy engine terminals where a variety of jobs must be handled 'round-the-clock each day. All locomotive bushing work, for example, can be handled on this machine, in addition to the turning of pins and bolts for spring rigging, crossheads, and the machining of valve rings.

The L. & S. 18 inch Gap Lathe (below) is noted for its versatility and ability to deliver the closest tolerances at top speed. Ample chucking capacity, with plenty of room in the gap for swinging large parts, simplify your piston truing jobs, for by removing the Gap Lathe Block, the job can be handled without removing the head.

L. & S. Engineers are always ready to help you with your shop modernization program.

THE **L** **S** **ENGINE**
ODGE & SHIPLEY **AUTOMATIC**
MACHINE TOOL CO. **TOOL ROOM**
CINCINNATI, OHIO, U.S.A. **OIL COUNTRY**
LATHES

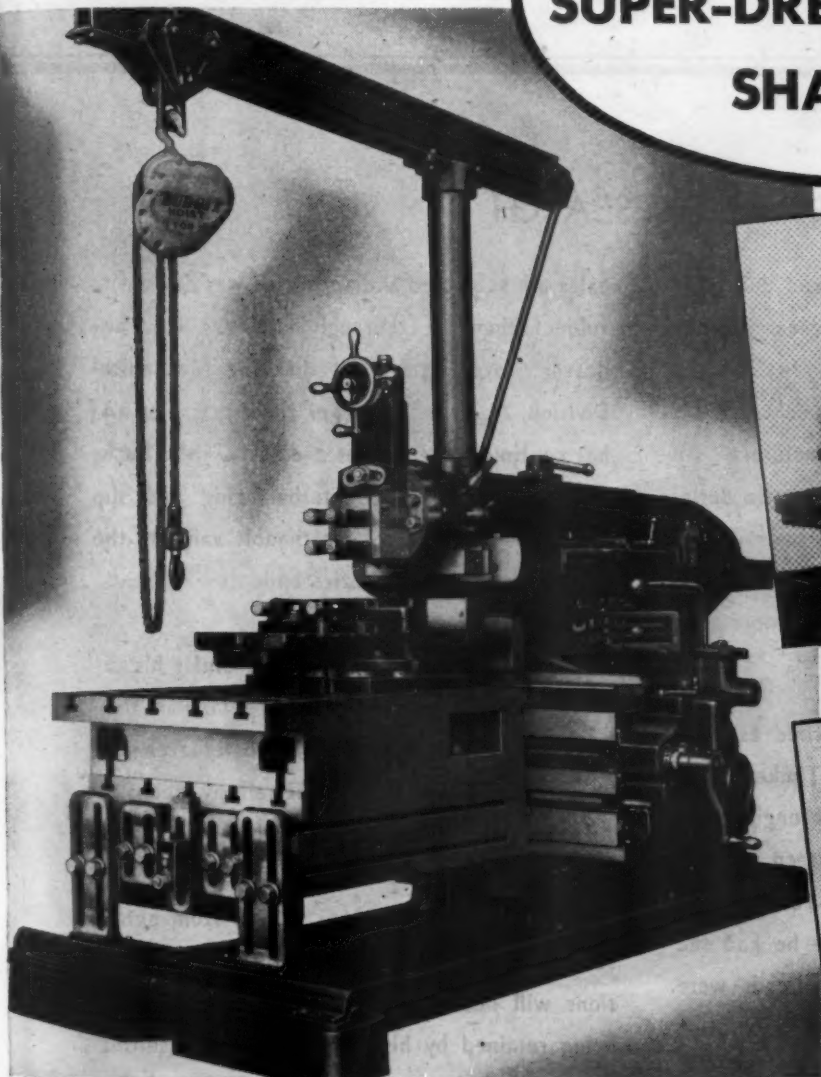


These and other American railways are users of Ohio Shapers: Atlantic Coast Line, A.T. & S.F., Burlington, Canadian Pacific, Central of N.J., C. & O., C. & N.W., D. & H., Erie, Frisco, Illinois Central, L. & N., Mexico National, Milwaukee, New Haven, N.Y.C., N. & W., Northern Pacific, Pennsylvania, Reading, Southern Pacific, Union Pacific, Wabash, Western Pacific.

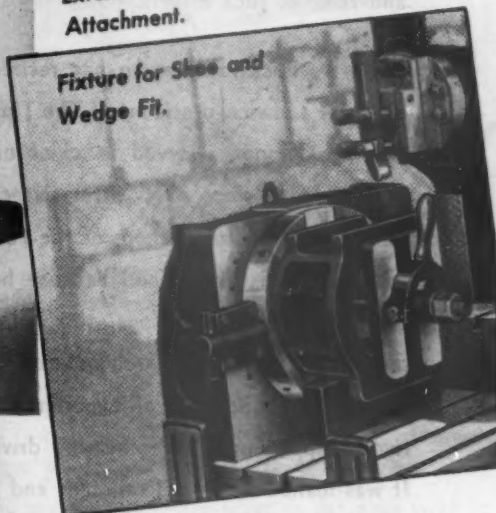
OHIO

SUPER-DREADNAUGHT SHAPERS

OHIO
STEP BY
PRODUCTION



Extension Head and Single Driving Box Attachment.



Fixture for Shoe and Wedge Fit.

The use of Ohio Shapers for many years by the country's foremost railroads attests their power, capacity, convenience and general adaptability to such severe service. The 36" Ohio Super-Dreadnaught Shaper shown here is unusually well suited to large, troublesome, oversize jobs. Specifications: table—30" x 48"; ram bearing in column—56" x 15"; length of ram without head—80"; long ram allows 36" stroke at any position on table or if work projects beyond front of table; maximum distance from drop table (when furnished) to ram—30"; weight of standard machine—13,400 lbs.

Bulletin No. 80 gives detailed information.

THE OHIO MACHINE TOOL COMPANY
KENTON, OHIO

RAILROAD ATTACHMENTS

Complete attachments for railroad shop use are available, including patented extension head with both vertical and circular feed for driving box work, single and double chucks for driving boxes, shoe and wedge chucks in several models, shell brass attachments, main rod brass attachments, fixtures for shoe and wedge fit, transfer gauges, etc.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

THE EDITOR'S DESK

MECHANICAL DEPARTMENT RESEARCH

There has been much discussion and debate as to the adequacy or inadequacy of research in the railway field, and frequently far too little recognition is given to the remarkable contributions made by the railway supply manufacturers. An able engineer has just retired from active duties in this field, whose contributions to scientific research, particularly as applied to the locomotive, illustrate in a pronounced way the importance and value of such efforts.

Tracy V. Buckwalter, who has retired as chief engineer and vice-president of The Timken Roller Bearing Company, served as chief engineer of that company since 1916, after sixteen years of service in the Altoona shops of the Pennsylvania. Because of his ability and because he had the courage of his convictions, the railroads were saved many years of research and experimentation through the building of an experimental locomotive equipped with roller-bearing driving boxes. It was loaned to several railroads and performed so satisfactorily that the extent and rate at which such bearings were applied was greatly speeded up.

Mr. Buckwalter was quick to recognize, also, that the application of these bearings introduced new and complex problems in locomotive axle design. As a result, measures were taken to analyze thoroughly the stresses to which the

axles are subjected and apparatus was devised to subject them to thorough testing. This endeavor proved so fruitful that the Mechanical Division, A. A. R., took over these activities and has continued the studies and tests. Mr. Buckwalter's studies in counterbalancing and slip tests have also been of inestimable value to the railroads and the locomotive builders.

While the studies and tests made under his direction were in some respects spectacular, they are characteristic of the thorough research and constructive engineering in the railway mechanical field by engineers and researchers of the railway supply manufacturers. Fortunately, although Mr. Buckwalter has retired from active service, his ability for making further contributions will not necessarily be lost, since he is being retained by his company in a consulting capacity. Indeed, relief from routine duties may make it possible for him to give more attention to yet unexplored problems in the field of locomotive design and construction—a field, by the way, that is assuming unusual importance as the railroads enter a new era, in which their equipment must be thoroughly modernized.

Roy V. Wright

The **KING WAY**



SAVES MONEY ON MANY LOCOMOTIVE PARTS

THE KING method of boring and turning is rapidly becoming very popular in the railroad industry—installations in leading railroad shops are proving that KING design and construction meet all production and precision requirements.

All KING Mills are built to take the heaviest cuts at the maximum speeds which the best of cutting tools will withstand. Naturally this feature provides

for maximum production and lower machining costs.

Yes! If you are searching for ways to increase your production on any boring and turning job from small rod bushings to your largest tires be sure to investigate the features built into KING mills. Single column machines, 30", 36" and 42" swing. Double column machines from 52" to 144" swing — all available with or without side head.

The **KING MACHINE TOOL** *Company*

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY
CINCINNATI, OHIO

your water treatment facilities can stand overloading ... if they are Dearborn.

When traffic peaks create the demand for a water volume beyond normal requirements, railroads with Dearborn Wayside Water Treatment plants find they can increase water output 4 or 5 times the normal capacity without impairing the efficiency of the equipment. The plants are built to take the extra load in their stride!

The Dearborn wayside feeder system is flexible, and increased boiler feedwater needs are met by merely charging the chemical tank more frequently. The feeders automatically take care of the increased demand.

Doubling-back and 'round-the-clock service calls for utmost locomotive availability

Locomotives served with Dearborn boiler water through the wayside plants eliminate shopping time for boiler repairs and premature tube replacement due to scale. Objectionable characteristics in raw waters are neutralized by Dearborn scientific methods of water treatment with the result that locomotives on Dearborn-serviced railroads take full throttle over long distances and through many water districts.

The Dearborn engineer in your vicinity will be glad to give you details on properly treated boiler water and increased feedwater output for your railroad.

DEARBORN CHEMICAL COMPANY

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TRADE MARK REGISTERED

**BOILER WATER
TREATMENT
AND SERVICE**



RAILWAY MECHANICAL ENGINEER

(Name Registered, U. S. Patent Office)
With which is incorporated the RAILWAY ELECTRICAL ENGINEER.

Founded in 1832 as the American Rail-Road Journal

Roy V. Wright
Editor, New York

JUNE, 1945

Volume 119

No. 6

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Locomotive:

| | |
|--|-----|
| Norfolk & Western Class J 4-8-4 Type Locomotives | 235 |
| Rock Island Steam Locomotives Modernized | 246 |

Car:

| | |
|-------------------------------------|-----|
| Air Conditioning for Passenger Cars | 243 |
|-------------------------------------|-----|

| | |
|---|-----|
| The 716th—A Good Outfit With a Few Poor Men | 250 |
|---|-----|

Editorials:

| | |
|--|-----|
| Mechanical Labor Conditions Critical | 251 |
| Safe Loading of Freight Cars | 251 |
| Sixty Clear Channels | 252 |
| Wartime Lessons Will Guide Future Operations | 252 |
| Use of Treated Car Lumber Increased | 253 |
| New Books | 253 |

Reader's Page:

| | |
|----------------------------------|-----|
| Turbine vs. Reciprocating Engine | 254 |
|----------------------------------|-----|

Car Foremen and Inspectors:

| | |
|------------------------------------|-----|
| Reclamation of Car Repair Material | 255 |
| Cleaning Car-Wheel Journals | 255 |
| Air Brake Questions and Answers | 255 |
| Treated Car Lumber | 256 |
| Machining Car Axles | 257 |

Backshop and Enginehouse:

| | |
|---|-----|
| Tire-Turning Mandrel | 260 |
| Sand Drying at the Oelwein Enginehouse | 260 |
| Welded Steel Parts | 262 |
| Locomotive Boiler Questions and Answers | 263 |

Electrical Section:

| | |
|------------------------------|-----|
| Electrical Shop for Diesels | 264 |
| Electrification 50 Years Old | 267 |
| Railroad Radio Channels | 269 |

New Devices:

| | |
|-----------------------------------|-----|
| Protected Type Motor | 271 |
| Blackhall Car Washer | 271 |
| Spray Gun for Cleaning Operations | 271 |

| | |
|------|-----|
| News | 272 |
|------|-----|

| | |
|----------------------|-----------------|
| Index to Advertisers | (Adv. Sec.) 176 |
|----------------------|-----------------|

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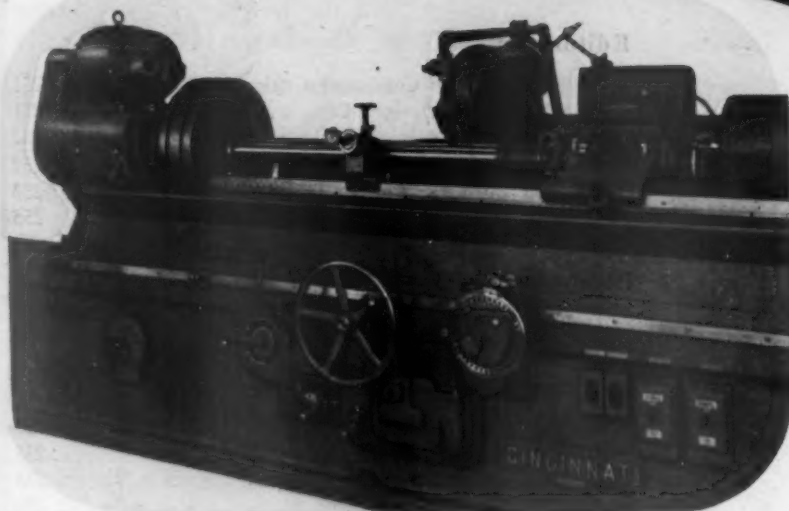
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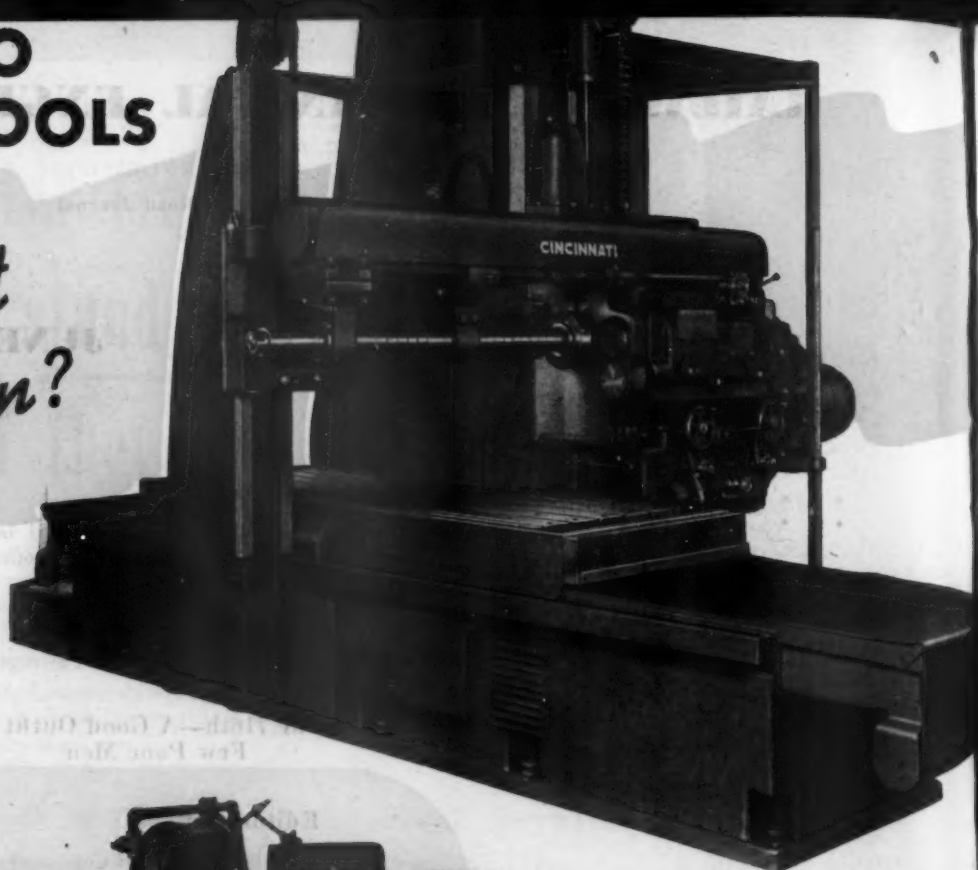
HOW DO MACHINE TOOLS

*help meet
competition?*

Below—CINCINNATI Piston Rod Grinding Machine. For 35" diameter of piston, maximum length 144" Catalog G-491-2



Below—CINCINNATI No. 2 Cutter and Tool Grinder. For sharpening a wide variety of milling cutters, taps, reamers, shaper tools, etc. Catalog M-962-2



Above — CINCINNATI 36" Series Horizontal Hydro-Tel Milling Machine. Has finger-tip control for easy and accurate adjustment of work to cutter, 72" or 120" table travel, 18" cross travel, 48" vertical travel. Catalog M-128

The competitive struggle with bus and airlines for freight and passenger traffic will soon be back again, and it will be keener than ever before. Of the many ways to meet this competition, new and modern machine tools are an important consideration.

For example, the *repair parts* needed for fast express and passenger locomotives *must be ready on time*. You can't afford to tie up rolling stock because of the inadequacy of a machine tool. you can't afford the delay of a break-down on the road.

Refinements in the design of locomotives and accessory equipment *call for closer accuracy*. Higher speeds mean closer accuracy of all sliding and rotating parts.

Cost of machining must be reduced still further. Semi-automatic machines can be tooled up with simple fixtures for several types of work, often replacing two and sometimes three older machines.

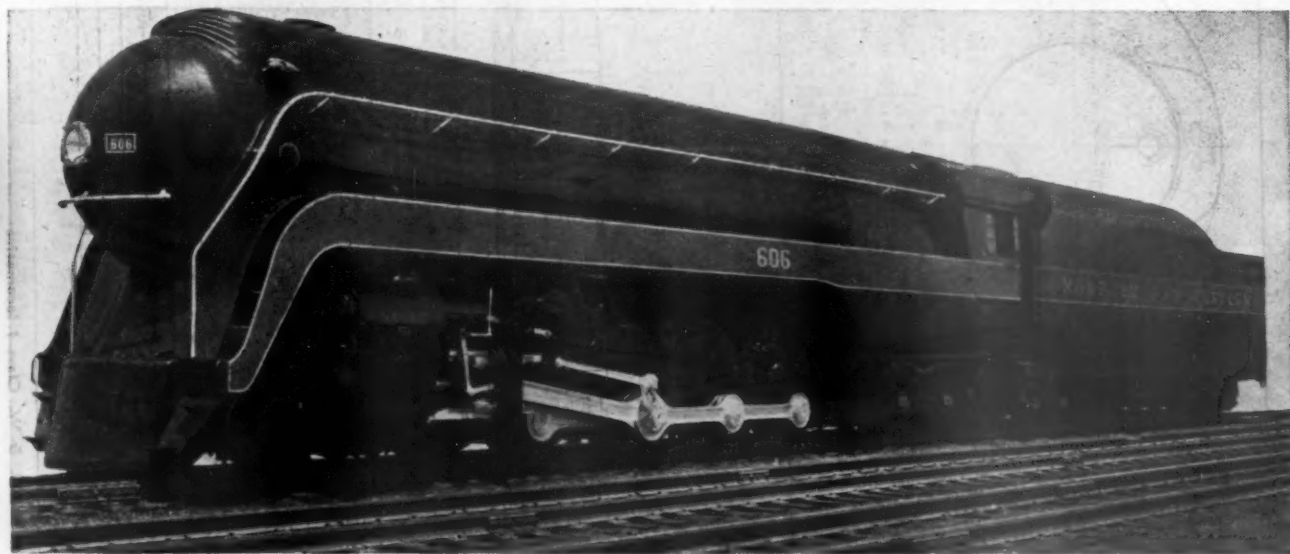
CINCINNATI Milling, Grinding, and Cutter Sharpening Machines go a long way toward meeting the requirements outlined above. Three types of these machines are illustrated here. Many other types are also available, all of which are illustrated in general catalog M-995-3. Write for literature, or ask for a visit by one of our field engineers.



THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES. SURFACE BROACHING MACHINES. CUTTER SHARPENING MACHINES.

N. & W. Class J 4-8-4 Locomotives



In October, 1941, the first of the Class J 4-8-4 type passenger locomotives went into service on the Norfolk & Western. There are now a total of 11 of this type being used in main-line passenger service handling heavy trains between Norfolk, Va., and Cincinnati, Ohio, as well as between Monroe, Va. (the junction with the Southern) and Bristol. The Class J locomotives bear the road numbers 600 to 610 and were built in the N. & W. shops at Roanoke, Va. They have a tractive force of 73,300 lb., 275 lb. boiler pressure, 70-in. drivers and a total engine weight of 494,000 lb. The weight on drivers is 288,000 lb. The tenders, carried on six-wheel trucks have a coal capacity of 35 tons and 20,000 gals. of water. Roller bearings are used on all axles, crank pins, cross-head pins, and on the valve gear. The boilers have a combined heating surface of 7,448 sq. ft. and a grate area of 107.7 sq. ft. The drawbar horsepower is in excess of 5,000.

In designing these locomotives the objective was to develop a steam motive power unit that would be capable of making long engine runs with a minimum of servicing and repairs; that would have sufficient hauling capacity to handle the heavy tonnage passenger trains that are a normal part of the N. & W.'s business over heavy mountain grades at relatively high speeds and, above all, perform this work at a cost lower than that which has been acceptable as steam locomotive operating cost for many years. Many of the design characteristics of the locomotive itself contribute to all three of these objectives but outstanding among the factors that enable this

**Modern passenger locomotives
take advantage of boiler capacity, roller bearings and unusual lubrication capacity to run high mileages at low cost**

power to do its present job are boiler capacity, roller bearings and mechanical lubrication.

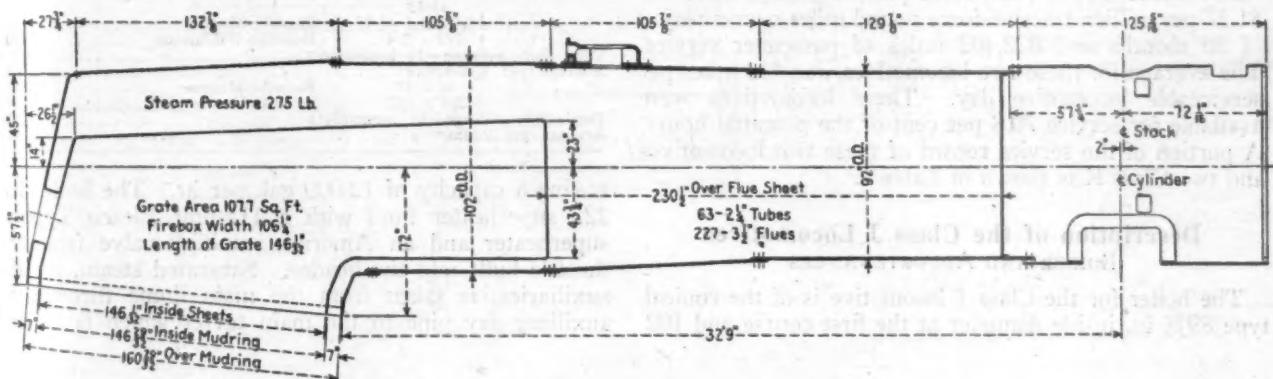
Since 1936 the Norfolk & Western has built a total of 116 locomotives with roller bearings and their value, in freight service particularly, shows up in the fact that, during the first six months of 1944 the roller bearing equipped locomotives representing 33 per cent of the freight locomotive inventory was making 68 per cent of the total steam freight mileage.

Coincident with the program to reduce both road and terminal delays by the use of roller bearings considerable study was given the matter of lubrication, with both oil and grease. Every locomotive part in which friction is a factor was carefully studied with a view either to using an anti-friction bearing, or improving the lubrication of that part in such a manner that service failures would be a remote possibility and maximum service life could be assured.

The results of this study in the matter of increasing the usefulness of the steam locomotive are to be seen in two



Wheeling one of the Class J's in the erecting shop



General Dimensions and Proportions of the Boiler

| | | | |
|---|-----------|---|-----------------|
| Steam pressure, lb. | 275 | Superheater, type | E |
| Diameter first ring, inside, in. | 89 3/4 | Fuel | Bituminous |
| Diameter first ring, outside, in. | 92 | Grate area, sq. ft. | 107.7 |
| Diameter second ring | Conical | Stoker, type | Standard HT |
| Diameter third ring, inside, in. | 100 3/4 | Feedwater heater, type | Worthington 6SA |
| Diameter third ring, outside, in. | 102 | Heating surfaces, sq. ft.: | |
| Sheet thickness, in.: | | Firebox and combustion chamber | 518 |
| Smokebox | 5 1/2 | Arch tubes | 60 |
| First ring | 1 1/2 | Firebox, total | 578 |
| Second ring | 1 1/2 | Tubes and flues | 4,693 |
| Third ring | 1 1/2 | Evaporative, total | 5,271 |
| Back head | 1 1/2 | Superheater | 2,177 |
| Side sheets | 1 1/2 | Combined evap. and superheat. | 7,448 |
| Roof sheet | 1 1/2 | Boiler proportions: | |
| Furnace door sheet | 1 1/2 | Firebox heat. surf., per cent comb. heat. surf. | 7.76 |
| Furnace side sheets | 1 1/2 | Tube-flue heat. surf., per cent comb. heat. surf. | 63.0 |
| Furnace crown sheet | 1 1/2 | Superheat surf., per cent comb. heat. surf. | 29.2 |
| Combustion chamber | 1 1/2 | Firebox heat. surf. + grate area | 5.36 |
| Front tube sheet | 1 1/2 | Tube-flue heat. surf. + grate area | 43.6 |
| Back tube sheet | 1 1/2 | Evap. heat. surf. + grate area | 48.9 |
| Firebox length, in. | 146 1/2 | Superheat surf. + grate area | 20.2 |
| Firebox width, in. | 106 1/4 | Comb. heat. surf. + grate area | 69.2 |
| Water space, front, in. | 7 | Gas area + grate area | 0.10 |
| Water space, back, in. | 7 | Tractive force + grate area | 680.5 |
| Water space, sides, in. | 7 | Weight of engine + evap. heat. surf. | 93.7 |
| Combustion chamber length, in. | 103 1/4 | Weight of engine + comb. heat. surf. | 66.3 |
| Arch tubes, number and diameter | (5) 3 1/2 | Tractive force + evap. heat. surf. | 13.9 |
| Syphons, number and location | None | Tractive force + comb. heat. surf. | 9.84 |
| Tubes, number and diameter | 63-2 1/2 | Tractive force X diameter drivers + comb. heat. surf. | 688.9 |
| Flues, number and diameter | 227-3 1/2 | | |
| Length over tube sheets, ft.-in. | 19-2 1/4 | | |
| Net gas area through tubes and flues, sq. ft. | 10.8 | | |

classes of locomotives designed and built by the N. & W. at its Roanoke, Va., shops—the Class A 2-6-6-4 type simple articulated and the Class J 4-8-4 type. In both of these designs mechanical lubrication and pressure has been utilized to the utmost. On the Class A locomotive a total of 336 points are lubricated—238 by oil from mechanical lubricators and 98 from grease through pressure fittings. Details of the lubrication of the Class J are to be found elsewhere in this article.

Detailed performance records compiled in connection with two of the Class A locomotives showed that in 87

Table I—Comparison of Performance, Class J and Class K Locomotives—Two Locomotives of Each Class Over a Period of 36 Months

| | Class J | | Class K-a | |
|--|-------------|------|-------------|------|
| | Hr. | Min. | Hr. | Min. |
| Time in shop | 4,019 | 16 | 7,741 | 10 |
| M.P. turning time | 11,326 | 28 | 7,517 | 51 |
| Total time unserviceable | 15,345 | 44 | 15,259 | 01 |
| Total C.T. delay | 7,712 | 28 | 14,154 | 32 |
| Total time at terminal | 23,058 | 12 | 29,413 | 33 |
| Total possible hours | 52,608 | | 52,512 | |
| Time available for service | 37,262 | 16 | 37,252 | 59 |
| Per cent availability | 70.8 | | 70.9 | |
| Total time in service | 29,549 | 48 | 23,098 | 27 |
| Per cent time in service | 56.2 | | 44.0 | |
| Total despatches | 4,095 | | 2,261 | |
| Total mileage | 822,402 | | 462,787 | |
| Average daily mileage | 412 | | 253 | |
| Total repair cost | \$94,918.92 | | \$72,594.74 | |
| Repair cost per locomotive-mile, cents | 11.54 | | 15.69 | |

months they made a total of 1,310,319 miles for a daily average (serviceable days) of 285 miles and that the maintenance cost was 21.12 cents per locomotive miles and \$2.02 per million tractive-force pound miles. During this time the locomotives were available for service 62.9 per cent of the potential hours.

Similarly, two of the Class J locomotives showed a maintenance cost of 11.54 cents per locomotive-miles and \$1.57 per million tractive-force pound miles over a period of 36 months and 822,402 miles of passenger service. The average for these two locomotives was 412 miles per serviceable locomotive day. These locomotives were available for service 70.8 per cent of the potential hours. A portion of the service record of these two locomotives and two Class K is shown in Table I.

Description of the Class J Locomotives BOILER AND APPURTENANCES

The boiler for the Class J locomotive is of the conical type 89 $\frac{3}{4}$ in. inside diameter at the first course and 102

in. outside diameter at the third course. All of the sheets in the boiler are carbon steel. The barrel sheets are 1 $\frac{1}{16}$, 1 $\frac{3}{16}$ and $\frac{3}{8}$ in. thick for the first, second and third courses, respectively, while the firebox sheets are $\frac{3}{8}$ in. and $\frac{1}{2}$ in. The front tube sheet is a flat $\frac{3}{4}$ -in. plate welded to a $\frac{3}{4}$ -in. by 4-in. ring which is riveted to the barrel. Braces of $\frac{3}{4}$ -in. material are welded to the tube sheet and to the ring.

The firebox, 146 $\frac{1}{2}$ in. long and 106 $\frac{1}{4}$ in. wide is completely welded and has a grate area of 107.7 sq. ft. The boiler is designed for a working pressure of 275 lb. and is equipped with four 3 $\frac{1}{2}$ -in. safety valves. A full installation of flexible staybolts is used in the breaking zones of the sides, crown and back head as well as in the combustion chamber and throat sheets. The butt-welded seam between firebox and throat sheets is reinforced by the welding of $\frac{1}{2}$ -in. by 3-in. rods across the seam at intervals providing additional stiffness to prevent flexure of the welded seam.

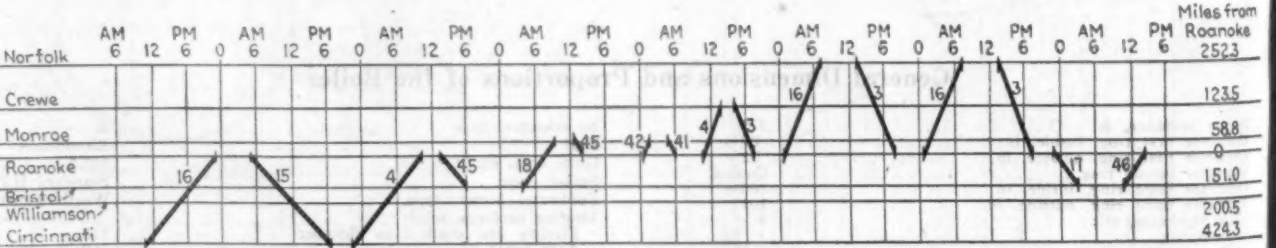
Bituminous coal is fed by a Standard HT stoker and the firebox is fitted with N. & W. standard grates equipped for power shaking with a steam grate shaker. The firedoor is the Franklin butterfly type No. 8. A Security brick arch is supported by five arch tubes 3 $\frac{1}{2}$ in. diameter.

Water is supplied by a Nathan Type 4,000 injector and a Worthington Type 6-SA feedwater heater each

Table II—Assignment and Mileage of Class J Locomotives

| No. of Locos. | Train Nos. | Territory | Mileage |
|------------------------------------|-------------------------|--------------------|---------|
| 2 | 4-15 and 16-3 | Roanoke-Norfolk | 1,008 |
| 8 | 3-16 and 15-4 | Roanoke-Cincinnati | 1,696 |
| | 17-46, 45-18, and 41-42 | Roanoke-Bristol | 906 |
| | 18-45 and 46-17 | Roanoke-Monroe | 232 |
| | 2/3 - 2/4 | Roanoke-Williamson | 402 |
| Total daily mileage—10 locomotives | | | 4,244 |
| Average per locomotive | | | 424 |
| 1 | 42 - 41 | Roanoke-Monroe | 116 |
| | 2/4 - 2/3 | Roanoke-Crewe | 248 |
| Total daily mileage—11 locomotives | | | 4,608 |
| Average per locomotive | | | 419 |

having a capacity of 12,000 gal. per hr. The boiler has 227 superheater flues with a 115-unit Elesco Type E superheater and an American multiple-valve front-end throttle built into the header. Saturated steam, for the auxiliaries, is taken from the main dome through an auxiliary dry pipe to the main turret which is located



| District | Train No. | Mileage | No. Cars |
|--------------------|-----------|---------|----------|
| Cincinnati-Roanoke | 16 | 424.3 | 11 |
| Roanoke-Cincinnati | 15 | 424.3 | 8 |
| Cincinnati-Roanoke | 4 | 424.3 | 14 |
| Roanoke-Bristol | 45 | 151.0 | 15 |
| Bristol-Monroe | 18 | 209.8 | 14 |
| Monroe-Roanoke | 45 | 58.8 | 14 |
| Roanoke-Monroe | 42 | 58.8 | 10 |
| Monroe-Roanoke | 41 | 58.8 | 13 |
| Roanoke-Crewe | 4 | 123.5 | 14 |
| Crewe-Roanoke | 3 | 123.5 | 9 |
| Roanoke-Norfolk | 16 | 252.3 | 14 |
| Norfolk-Roanoke | 3 | 252.3 | 9 |
| Roanoke-Norfolk | 16 | 252.3 | 17 |
| Norfolk-Roanoke | 3 | 252.3 | 12 |
| Roanoke-Bristol | 17 | 151.0 | 14 |
| Bristol-Roanoke | 46 | 151.0 | 15 |

Total loco. mileage (seven days) 3,368.3

The runs made by one Class J locomotive in seven days' operation are plotted on the above chart—The details are shown in the table

outside of the cab. The main steam valve is located at the dome connection.

The shrouding effects a straight line flush with the top of the cab and conceals stack, bell, whistle, low water alarm, sand boxes, dome, turrets and feedwater heater. It also makes possible the concealment of the piping and, to carry out the clean external lines of the jacket and shrouding there is a 4½-in. by 9½-in. trough recessed into the left side of the smokebox to carry six pipes from the inside of the smokebox to the top of the boiler underneath the jacket.

FOUNDATION AND RUNNING GEAR

The engine bed is a General Steel Castings Corporation steel casting in which cylinders, back heads, guide and valve motion supports and cross members are cast as an integral part of the bed.

The spring rigging is the conventional equalizer and elliptic spring design with reverse camber driving springs. The equalization is continuous from the front of the No. 1 driver to the rear of the rear trailer wheel.

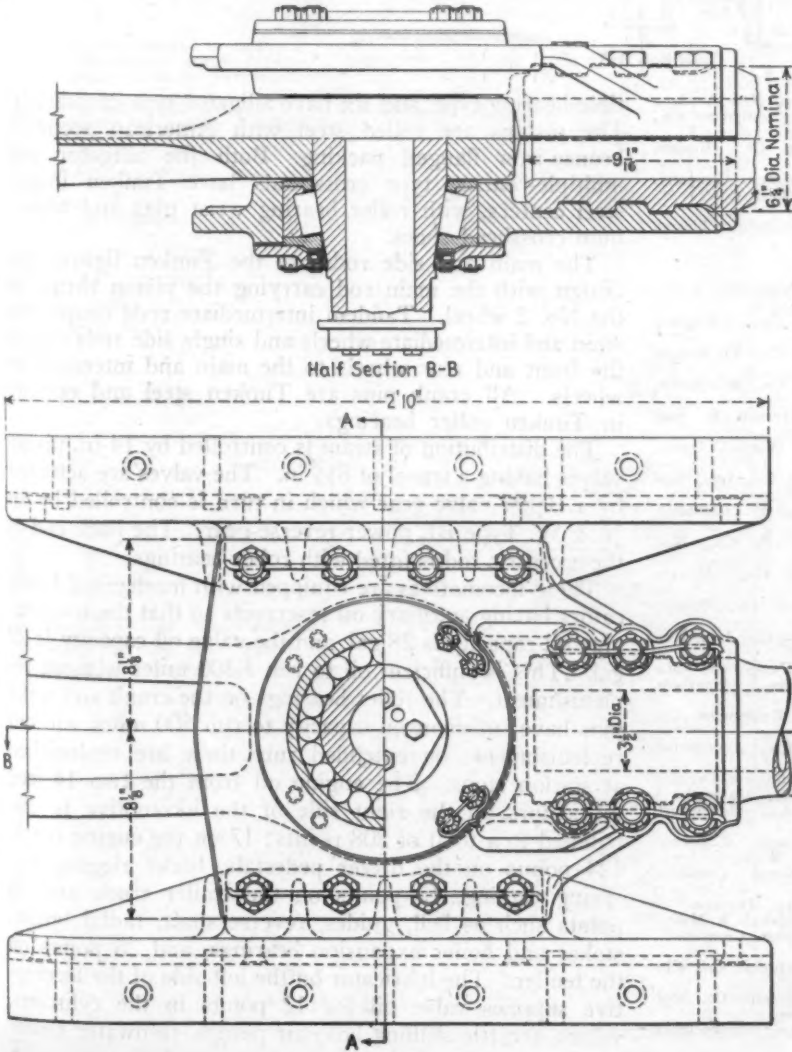
The engine truck is the General Steel Castings Corporation's constant resistance type with carbon steel axles, 36-in. steel tired wheels and Timken roller bearings. The journals are 7½ in. diameter. The Commonwealth trailer truck, supplied by the same manufacturer, is the outside bearing type with Timken roller bearings mounted on carbon steel axles having 8-in. journals. A Type E. Franklin booster is applied to the rear trailer axle of one

locomotive. Both front and rear wheels are steel tired, 42 in. diameter, mounted on cast-steel centers.

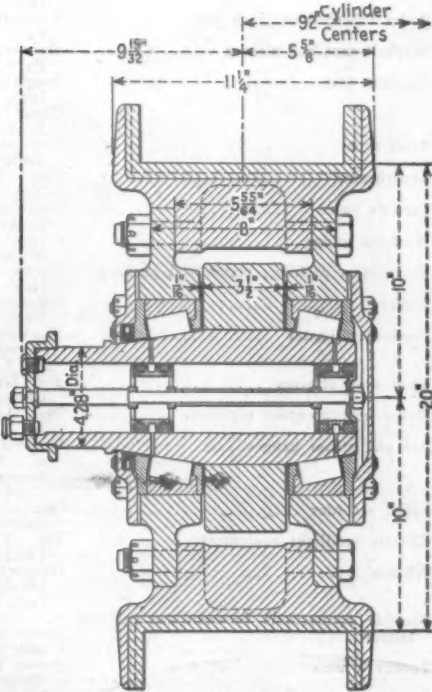
The driving wheels have cast-steel centers with 70-in.

General Dimensions, Weights and Proportions of the Norfolk & Western 4-8-4 Type Class J Locomotives

| | |
|---|---------------|
| Road class | J |
| Road numbers | 600-610 |
| Builder | Company shops |
| Date built | 1941, 1943 |
| Steam pressure, lb. per sq. in. | 275 |
| Drivers, diameter, in. | 70 |
| Cylinders, number, diameter and stroke, in. | (2) 27 x 32 |
| Rated tractive force, engine, lb. | 73,300 |
| Rated tractive force, booster, lb. (one locomotive) | 12,500 |
| Valve gear, type | Baker |
| Valves, piston, diameter, in. | 14 |
| Maximum travel, in. | 8¾ |
| Steam lap, in. | 1½ |
| Exhaust clearance, in. | 8/16 |
| Lead, in. | ¼ |
| Cut-off in full gear, per cent | 82.0 |
| Dimensions: | |
| Height, rail to top of stack, ft.-in. | 16- 0 |
| Height, rail to center of boiler, ft.-in. | 10- 8 |
| Width overall, ft.-in. | 11- 2 |
| Length over engine and tender, ft.-in. | 109- 2¾ |
| Cylinder centers, in. | 92 |
| Wheel bases, ft.-in.: | |
| Driving | 18- 9 |
| Rigid | 18- 9 |
| Engine, total | 47- 3½ |
| Engine and tender, total | 95- 4¾ |
| Weights, lb.: | |
| Front truck | 101,600 |
| Drivers | 288,000 |
| Trailer truck | 104,400 |
| Engine, total | 494,000 |
| Tender (loaded) | 178,600 |
| Weight on drivers, per cent weight of engine | 3.93 |
| Weight on drivers ÷ tractive force | 58.2 |
| Tender: | |
| Style or type | Rectangular |
| Water capacity, U. S. gal. | 20,000 |
| Fuel capacity, U. S. gal. | 35 |
| Trucks | Six-wheel |



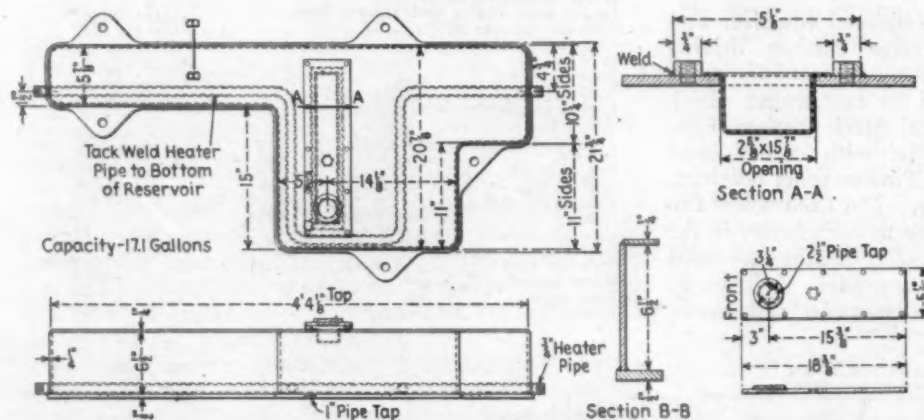
Details of the alligator crosshead and roller-bearing wrist-pin arrangement



Section A-A

Partial List of Materials and Equipment on the Norfolk & Western 4-8-4 Type Class J Locomotives

| | |
|--|---|
| Engine bed; cylinders; tender underframe; pilot; engine and trailer trucks | General Steel Castings, Corp., Eddystone, Pa. |
| Tires; driving and trailer | Midvale Co., Nicetown, Pa. |
| Axles; engine and tender truck | J. R. Johnson & Co., Inc., Richmond, Va. |
| Driving axle; roller bearings on engine and trailer trucks; crankpins; side and main rods; crosshead; piston rod | The Timken Roller Bearing Co., Canton, Ohio. |
| Adjustable shoes; wedges; snubbers; radial buffer | Franklin Railway Supply Co., Inc., New York. |
| Pilot coupler | Buckeye Steel Castings Co., Columbus, Ohio. |
| Brake equipment | Westinghouse Air Brake Co., Wilmerding, Pa. |
| Foundation brakes | American Brake Div. of Westinghouse Air Brake Co., Swissvale, Pa. |
| Sander | The Prime Manufacturing Co., Milwaukee, Wis. |
| Cylinder packing rings | American Hammered Piston Ring Div., Koppers Company, Baltimore, Md. |



One of the 17-gallon auxiliary reservoirs used in connection with mechanical lubricators—These help make possible 1,300 miles of operation without replenishing engine and valve oil

| | |
|---|--|
| Valve gear | The Pilliod Co., New York. |
| Whistle operating valve; bell ringer | Viloco Railway Equipment Co., Chicago. |
| Safety valves | Ashton Valve Co., Boston, Mass. |
| Blower valve | The Lunkenheimer Company, Cincinnati, Ohio. |
| Blow-off cocks; cylinder cocks; operating valves | The Okadec Company, Chicago. |
| Mechanical lubricators; boiler checks; injector; injector steam valves; injector checks and cut-off valves; water column; low water alarm | Nathan Manufacturing Co., New York. |
| Boiler and firebox steel | Worth Steel Co., Claymont, Del. |
| Boiler tubes; flues; arch tubes | National Tube Co., Pittsburgh, Pa. |
| Staybolt caps and sleeves | Flannery Bolt Co., Bridgeville, Pa. |
| Staybolt iron | Joseph T. Ryerson & Son, Inc., Chicago. |
| Brick arch | Ulster Iron Works, Dover, N. J. |
| Superheater | American Arch Co., Inc., New York. |
| Throttle valve | The Superheater Company, New York. |
| Washout plugs | American Throttle Co., New York. |
| Valve stem packing; piston rod packing | Huron Mfg. Co., Detroit, Mich. |
| Stoker | Paxton-Mitchell Co., Omaha, Neb. |
| Feedwater heater | Standard Stoker Co., Inc., New York. |
| Tank hose strainer | Worthington Pump and Machinery Corp., Harrison, N. J. |
| Steam heat pressure regulator | T-Z Railway Equipment Co., Chicago. |
| Air and steam gauges | The Leslie Co., Lyndhurst, N. J. |
| Speed recorder | Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn. |
| Electric headlight equipment | General Electric Company, Schenectady, N. Y. |
| Whistle | The Pyle-National Company, Chicago. |
| Flexible connections between engine and tender | Hancock Valve Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn. |
| Tender wheels | Barco Manufacturing Co., Chicago. |
| Tender truck roller bearings | Armco Railroad Sales Co., Middletown, Ohio. |
| | SKF Industries, Philadelphia, Pa. |

tires. The centers are mounted on carbon steel solid axles operating in Timken roller bearings. The main journal is $13\frac{1}{2}$ in. diameter and the others are $12\frac{9}{16}$ in. diameter. The weight of the reciprocating parts of these locomotives is 1,547 lb., of which 35.6 per cent is balanced. The weight of the revolving parts is 2,747 lb. The overbalance is 175 lb. for the front, intermediate and back wheels and for the main wheels, 25 lb. The dynamic augment at 70 m.p.h. is 9,016 lb. for the front, intermediate and back wheels and 1,284 lb. at the main wheel. A speed of 140 m.p.h. would be required in order that the dynamic augment equal the static wheel load of 36,000 lb. The maximum sustained speed of the Class J locomotives handling 14 cars (1,000 tons) on level tangent track is 100 m.p.h.

The piston, rod and crosshead assembly is the Timken lightweight design. Five of these locomotives have mul-

multiple-bearing type, and six have alligator-type crossheads. The pistons are rolled steel with American sectional bronze-iron flanged packing. Both the alligator and multiple-bearing type crossheads have Timken forged steel centers, with roller bearing wrist pins and aluminum crosshead shoes.

The main and side rods are the Timken lightweight design with the main rod carrying the piston thrust to the No. 2 wheel. Tandem intermediate rods couple the main and intermediate wheels and single side rods couple the front and rear wheels to the main and intermediate wheels. All crank pins are Timken steel and operate in Timken roller bearings.

The distribution of steam is controlled by 14-in. piston valves having a travel of $8\frac{1}{2}$ in. The valves are actuated by a Baker valve gear which in turn is controlled by an N. & W. Type BL power reverse gear. The back end of the eccentric rod is fitted with roller bearings.

These locomotives are equipped with mechanical lubricators having auxiliary oil reservoirs so that the total engine oil capacity is 28 gal. and the valve oil capacity is 22 gal. This is sufficient oil to run 1,300 miles without replenishment. The roller bearings on the crank and wrist pins have sufficient oil capacity to run 500 miles without replenishment; on extended runs these are replenished at station stops. The engine oil from the two 14-feed lubricators on the right side of the locomotive is distributed to a total of 208 points; 17 on the engine truck, 124 points on the driver pedestals, brake rigging and spring rigging, 13 points on the trailer truck and 28 points such as bell, guides, reverse shaft, radial buffer, stoker and boiler expansion bearings, and 26 points on the tender. The lubricator on the left side of the locomotive supplies valve oil for 12 points in the cylinders, valves, throttle stuffing box, air pumps, feedwater heater

and stoker engine. In addition 72 points are equipped with fittings for pressure grease lubrication.

| | Maximum for one loco. | Minimum for one loco. | Average for five locos. |
|---|-----------------------------|-----------------------------|-------------------------------|
| Accumulated mileage from date built to first shopping for general repairs | 252,314 | 227,981 | 238,180 |
| No. of possible days in above period | 697 | 635 | 659 |
| Mileage per day | 372 | 352 | 361 |
| No. of unserviceable days | 52 | 34 | 43 |
| Miles made each serviceable day | 400 | 371 | 387 |
| No. of times fire cleaned | 138 | 72 | 103.2 |
| Miles per fire cleaning | 3,166 | 1,706 | 2,455 |
| No. of despatches | 1,475 | 1,277 | 1,395 |
| Despatches per fire cleaning | 19.3 | 10.4 | 14.4 |

The brake equipment of these locomotives is the Westinghouse Schedule ET-8 with two 8½-in. cross compound compressors mounted on frame brackets under the smokebox front.

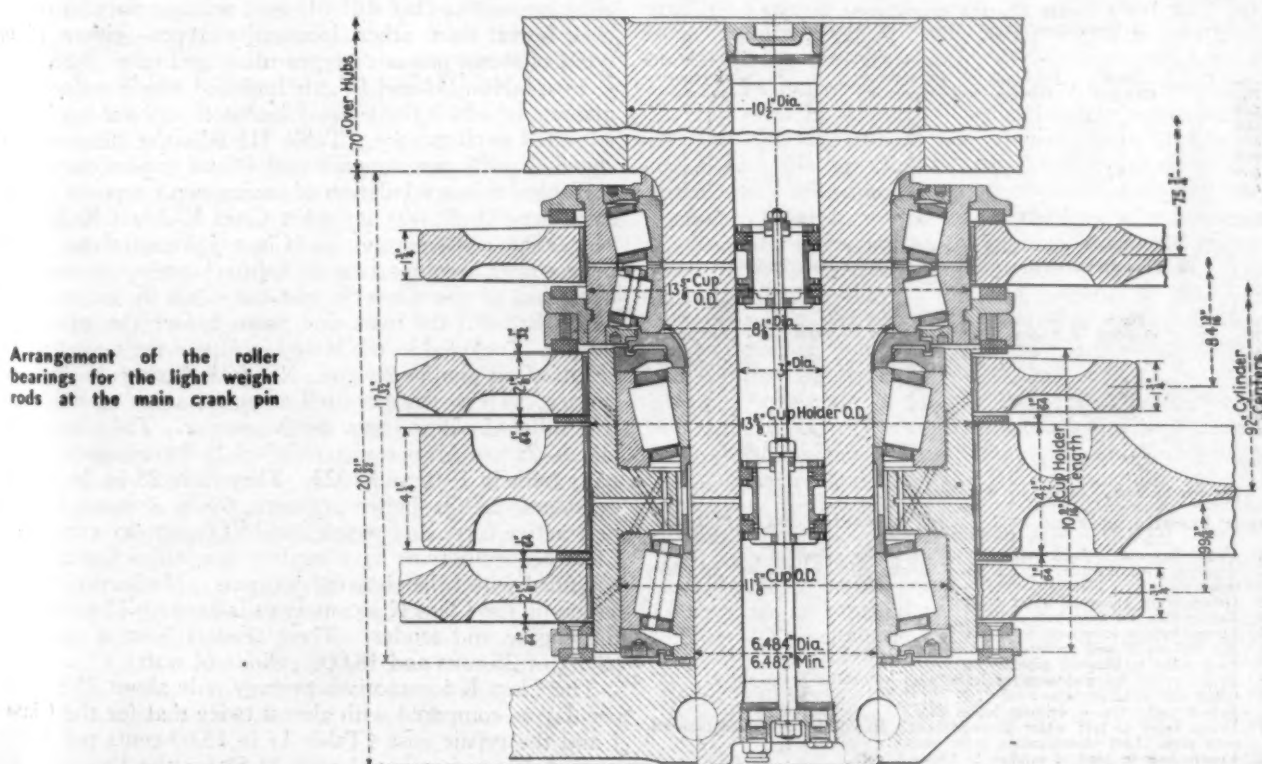
The tenders for these locomotives are of the rectangular type with a riveted tank 42 ft. 7¼ in. long, having a capacity of 20,000 gals. and 35 tons of coal mounted on a water bottom cast-steel underframe and carried on two General Steel Castings Corporation's six-wheel trucks on 27-ft. 6-in. truck centers. The tender trucks are equipped with SKF roller bearings. The tender tank is riveted to the underframe and seal welded.

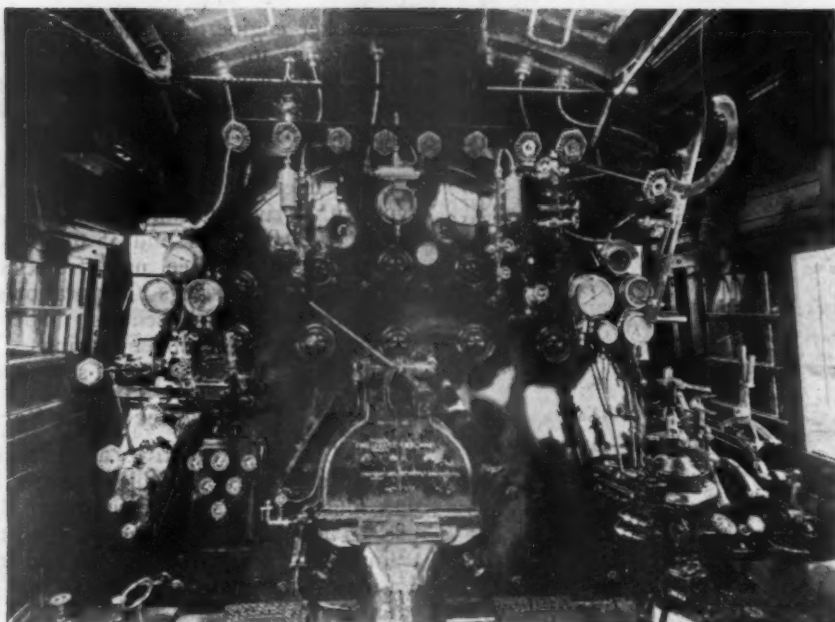
The Class J locomotives are used exclusively in passenger service and like all passenger locomotives schedules must of necessity be the controlling factor in their use. These 11 locomotives are used to handle main-line trains Nos. 3 and 4 and Nos. 15 and 16 between Norfolk, Va., and Cincinnati, Ohio, a distance of 676.6 miles and trains Nos. 17 and 18, 45 and 46 and 41 and 42 between Monroe, Va., and Bristol, Va., a distance of 209.8 miles. Shaffers Crossing (Roanoke, Va.) engine terminal is the home terminal for these locomotives and the round trips of 504.6 miles from that point to Norfolk and 848.6 miles to Cincinnati are typical of the runs. The elapsed time of Train No. 3 from Norfolk to Cincinnati is 18 hr. 45 min. and, in the reverse direction, Train No. 4 is also 18 hr. 45 min. This time must be considered in relation to a line of road that crosses the Allegheny and Blue Ridge Mountains with ruling grades, in several districts, of approximately 1.4 per cent. Except between Williamson, Va., and Bluefield, Va., where the ruling grade is 2.00 per cent these locomotives will handle 15 cars without help. The time must also be related to as many as 31 scheduled stops, on some runs, between Cincinnati and Norfolk. With large capacity tenders and complete

| | | | |
|--|--------|--------|--------|
| Cylinder packing rings, average mileage per renewal—right side | 76,228 | 33,927 | 51,778 |
| Cylinder packing rings, average mileage per renewal—left side | 81,477 | 59,372 | 70,053 |
| Piston rods, average mileage per re-grounding—right side | 56,995 | 42,052 | 47,636 |
| Piston rods, average mileage per re-grounding—left side | 56,995 | 40,738 | 45,804 |
| Crosshead shoes, average mileage per relining, right side | 34,919 | 25,409 | 30,536 |
| Crosshead shoes, average mileage per relining, left side | 45,596 | 22,868 | 32,187 |

| | | | |
|--|---------|---------|---------|
| Engine truck, front wheels | 24,939 | 20,099 | 23,351 |
| Engine truck, rear wheels | 63,078 | 43,952 | 49,621 |
| Driving wheels | 126,157 | 113,990 | 119,090 |
| Trailer truck, front wheels | 118,475 | 84,105 | 108,264 |
| Trailer truck, rear wheels (without booster) | 126,157 | 79,163 | 99,241 |
| Trailer truck, rear wheels (with booster) | | 74,811 | |
| Tender wheels: | | | |
| No. 1 position | 113,990 | 47,498 | 59,545 |
| No. 2 position | 126,157 | 61,108 | 85,064 |
| No. 3 position | 79,163 | 50,463 | 62,679 |
| No. 4 position | 84,105 | 45,596 | 54,132 |
| No. 5 position | 113,990 | 63,078 | 79,393 |
| No. 6 position | 118,745 | 61,108 | 79,393 |
| Average for all positions | | | 71,453 |

| | | | |
|---|------------|------------|------------|
| No. of failures charged to engine | 2 | 1 | 1.4 |
| Average mileage per engine failure | 252,314 | 113,990 | 170,129 |
| No. of engine failures charged to other causes | 4 | n | 1.8 |
| Average mileage, such failures | 227,981 | 63,078 | 132,322 |
| Total number of engine failures, five locomotives | | 16 | 3.2 |
| Average mileage per engine failure | 237,490 | 50,463 | 74,431 |
| Cost of classified repairs: | | | |
| Labor | \$5,840.13 | \$5,210.20 | \$5,584.65 |
| Material | 7,687.80 | 2,981.82 | 4,765.78 |
| Labor and material | 13,527.93 | 8,192.02 | 10,350.43 |





lubrication service stops, other than those co-incident with station stops, have almost been eliminated. An

accompanying chart shows graphically, a typical week's work for one of the Class J locomotives. The assignment of the entire group of 11 locomotives is shown in Table II.

Table IV—Tabulation of Enginemen's Reports—Shaffer's Crossing Enginehouse

EIGHT CLASS K-2, K-2A LOCOMOTIVES
31 DAYS OPERATION (MONTH OF OCTOBER 1944)

| Loco. No. | Days shopped | No. blank reports | No. with work reported | Total | Per cent with work reported to total |
|-----------|--------------|-------------------|------------------------|-------|--------------------------------------|
| 117 | 1 | 2 | 23 | 25 | 92.0 |
| 124 | 14 | 3 | 7 | 10 | 70.0 |
| 125 | 1 | 2 | 16 | 18 | 88.9 |
| 127 | 6 | 1 | 17 | 18 | 94.4 |
| 128 | 1 | 1 | 17 | 18 | 94.4 |
| 129 | 1 | 4 | 13 | 17 | 76.5 |
| 130 | 5 | 3 | 9 | 12 | 75.0 |
| 132 | 2 | 4 | 13 | 17 | 76.5 |
| Total | 31 | 20 | 115 | 135 | 85.2 |

SIX CLASS J LOCOMOTIVES
30 DAYS OPERATION (MONTH OF APRIL 1944)

| Loco. No. | Days shopped | No. blank reports | No. with work reported | Total | Per cent with work reported to total |
|-----------|--------------|-------------------|------------------------|-------|--------------------------------------|
| 605 | 1 | 108 | 14 | 122 | 11.5 |
| 606 | 0 | 106 | 16 | 122 | 13.1 |
| 607 | 1 | 106 | 19 | 125 | 15.2 |
| 608 | 1 | 100 | 14 | 114 | 12.3 |
| 609 | 0 | 91 | 16 | 107 | 15.0 |
| 610 | 1 | 107 | 18 | 125 | 14.4 |
| Total | 4 | 618 | 97 | 715 | 13.6 |

SIX CLASS J LOCOMOTIVES
26 DAYS OPERATION (OCTOBER 9 TO NOVEMBER 3, 1944)

| Loco. No. | Days shopped | No. blank reports | No. with work reported | Total | Per cent with work reported to total |
|-----------|--------------|-------------------|------------------------|-------|--------------------------------------|
| 605 | 0 | 85 | 13* | 98 | 13.3 |
| 606 | 0 | 78 | 17 | 95 | 17.9 |
| 607 | 0 | 90 | 17 | 107 | 15.9 |
| 608 | 10 | 55 | 8 | 63 | 12.7 |
| 609 | 10 | 38 | 15 | 53 | 28.3 |
| 610 | 0 | 88 | 14 | 102 | 13.7 |
| Total | 20 | 434 | 84 | 518 | 16.2 |

* See list of items covered by these reports.

ITEMS REPORTED ON FORM M.P. 60 FOR LOCOMOTIVE No. 605 DURING 26 DAYS OPERATION

- 1 Cotter key out of back end right No. 1 trailer equalizer pin.
- 2 Trouble with throttle, No. 5 valve stuck. Give guides and cylinders more oil.
- 3 Grind drain valve to water column.
- 4 Repair foot warmer, both sides.
- 5 Steam leak at overflow to injector.
- 6 Fix bell so it will operate.
- 7 Pack joint to blow-off pipe.
- 8 Brake valve dry and won't release with automatic brake valve.
- 9 Clean out sand pipes.
- 10 Renew right No. 4 driving brake shoe.
- 11 Drain valve to left water glass leaking. Bad leak in muffler blow-off cock pipe. Left classification lamp out.
- 12 Repair leak in pipe to muffler to blow-off cock.
- 13 Flat spots on drivers.

Mechanical Performance

As mentioned elsewhere in this article the Class J locomotives represent not only an evolution in design embodying the service-ried features of the Class A power but they also represent a definite effort to develop a steam locomotive that will (1) give the maximum in reliability of service; (2) require a minimum of servicing and repair at terminals; (3) operate 250,000 miles, or more, between shoppings for general repairs and, above all, a locomotive that will (4) give this service at a repair cost lower than other locomotive types—either older types of steam power or types using fuel other than coal.

Two tables, III and IV, are included which indicate the manner in which the Class J locomotives have met their expected performance. Table III tells the story of mechanical parts performance and is self explanatory.

Table IV is a tabulation of enginemen's reports (N. & W. Form M. P. 60) for eight Class K-2 and K-2a passenger locomotives and six Class J locomotives. The table shows a comparison of approximately one month's operation of the Class J, and the Class K locomotives which handled the main-line trains before the advent of the J's. Included in the table is a list of the actual work required on one locomotive, No. 605, during 26 days of service. These statistics tell a typical story of the relative value of old and new motive power. The Class K-2 and K-2a are Mountain type (4-8-2) locomotives originally built in 1919 and 1923. They have 28-in. by 30-in. cylinders, 220-lb. boiler pressure, 69-in. drivers, 63,800 lb. tractive force and weigh 248,150 lb. on drivers. The Class K locomotives have modern specialties but are not equipped with roller bearing journals. Mechanical lubrication on the Class K locomotives is used on 11 points on the engine and tender. Their tenders have a coal capacity of 26 tons and 18,000 gallons of water.

The Class K locomotives average only about 250 miles per day as compared with almost twice that for the Class J and the repair cost (Table I) is 15.69 cents per locomotive-mile as compared with 11.54 for the J's.

Air Conditioning for Passenger Cars

THE following two papers were presented before the March 15, 1945, meeting of the Southern and Southwestern Railway Club in Atlanta, Ga. Only that portion of J. P. Morris' paper relating to temperature con-

trol is printed here. He also described the method of heat distribution which could be looked for in new and rebuilt cars and the required parts and fittings used in its installation. H. W. Keyser's paper is complete.—EDITOR.

Problems and Answers in Passenger-Car Air-Conditioning

By H. W. Keyser

The Safety Car Heating & Lighting Co., Inc., New York

There has been considerable controversy among several of the railroads regarding the origin of railway-car air-conditioning, however records indicate that the Baltimore & Ohio installed equipment on one coach in 1929. This was a compressor-type using ammonia gas to cool a calcium chloride brine. The power to drive the compressor was obtained from a 30 kw. single phase 220-volt steam-turbine generator on the locomotive. In 1930 both the Atchison, Topeka & Santa Fe and B. & O. equipped one dining car. In 1931 the Missouri-Kansas-Texas equipped three diners. On May 24, 1931, the B. & O. inaugurated the Columbian, consisting of two completely air-conditioned seven-car trains making a round trip each day between Jersey City and Washington. This was also compressor-type equipment using ammonia gas and was driven by 25-hp. gasoline engines. The compressors and condenser fans were belted to a jack shaft which was driven by the engine through a centrifugal clutch. When the engine speed reached a certain value, the clutch engaged the jack shaft driving the compressor and fan.

At the close of the 1932 cooling season, 357 passenger cars of various types were equipped with air-conditioning. In the following 10 years 13,000 additional cars were equipped, giving a total of approximately 13,300 air-conditioned railroad and Pullman cars operating in this country before Government restrictions prohibited the manufacture of equipment.

Now that air-conditioning is no longer in its infancy let us look back and review some of the early difficulties that had to be solved. Like all equipment designed for railroad service, a great many problems confronted the manufacturers of air-conditioning equipment. It was necessary to design the units so that they could be accommodated in the smallest possible space, thereby requiring a minimum number of changes in existing equipment.

Weight was also a matter of great importance to railroads. Not only does it involve increased costs in operation due to hauling heavy equipment, but it may require larger axles, heavier springs and new trucks. Capacity is a requirement substantially fixed by passenger load and outside conditions. The load of seven tons was based

on a passenger load of 2.5 tons, solar radiation 1 ton, fresh air 2.1 tons, conduction through car structure 1.4 tons. Power was another definite requirement governed somewhat by capacity. The engineers, however, endeavored to develop efficient equipment to keep the power demand at a minimum. Accessibility for servicing and inspection was another prime requisite. Dependable performance was the result of proper consideration of all factors in design.

More Comfort in New Cars

The various carbuilders have orders for approximately 1,200 new passenger cars and it is estimated that after the war two to three thousand new cars will be built each year for a period of five years. Most of these new passenger cars will reflect the progress that has been made in the design and installation of cooling equipment as well as the further development of innovations made possible by air-conditioning. Sealed double windows insulating against outside temperature, dust and noise, will insure the traveling public a quiet and clean trip. Many other refinements related to air-conditioning have been developed to increase the comforts of passengers. Electrostatic filters are on the market which will remove dust particles as small as 1/250,000 of an inch. This ingenious device charges the dust particles as they pass through an electrostatic field and these charged particles are attracted to plates which are of the opposite polarity and are thereby removed from the air stream. Some use also has been made of filters containing activated carbon for reducing odors. Temperature and humidity controls are available which will maintain comfortable conditions for passengers and eliminate the responsibility of train attendants to adjust the car temperatures as weather conditions vary. Variable-speed motor-driven compressors, or compressors with unloading devices, used in conjunction with divided evaporators can be a valuable asset in maintaining constant temperature and humidity.

The cooling equipment itself has been greatly improved by utilizing durable materials for longer life. Slight changes in design permit greater accessibility and improved maintenance. It is doubtful if any radical changes

will be made from the three most common systems; that is, the ice activated, mechanical, and steam ejector. For the benefit of those not acquainted with these systems, I shall explain briefly the principles of operation of each.

Air conditioning is defined as the simultaneous control of temperature, humidity, movement and purity of air. In reducing the temperature, it is of course necessary to use some means of refrigeration. Refrigeration is a cooling process, or the transfer of heat from one substance to another, and cooling a car is primarily the transfer of heat from inside the car to the outside air. Most systems utilize a cooling coil or evaporator over which air is blown by a fan. This air is cooled on contact with the coil and is distributed throughout the car.

In the ice activated system water is cooled by contact with ice in the ice bunker and is circulated by a pump through a cooling coil. This water absorbs heat from the air passing over the coil and returns to the ice bunkers, where it is sprayed over the ice and loses the heat that was absorbed in the coil.

Refrigeration is obtained in the mechanical system by evaporating a liquid that has a relatively low boiling point. Freon is the refrigerant universally used in railway service. The system is composed of a compressor, condenser, and evaporator or cooling coil. The compressor may be driven by motor, gas engine, or direct from the car axle. The Freon refrigerant in a liquid state flows through the expansion valve into the evaporator. The pressure in the evaporator is comparatively low and some of the refrigerant evaporates, lowering its temperature. The low temperature refrigerant flows through the coils and absorbs heat from the air circulated over the evaporator, vaporizes, and becomes a gas. This gas or vapor enters the suction side of the compressor and is compressed. This increases its pressure and temperature and discharges it into the condenser, where it is cooled and condensed into a liquid. At this point, the heat from inside the car plus heat of compression is transferred to the outside air. The liquid refrigerant from the condenser flows into the liquid receiver and then to the expansion valve for another cycle. Several refinements, which increase the efficiency of the system, may be added to the cycle as some manufacturers recommend sub-coolers, and heat interchangers to reduce the temperature of the liquid refrigerant before it enters the expansion valve.

The steam-ejector system, like the ice activated, uses an inexpensive and easily obtained refrigerant—water.

At ordinary temperatures and pressures water is a liquid, but we know it can be changed to a vapor by in-

creasing its temperature. At sea level, water under atmospheric pressure boils at 212 deg. F.; if, however, the atmospheric pressure is reduced, it boils at lower temperature and its boiling point drops rapidly as the pressure on its surface is reduced. At 29.54 inches of vacuum, water boils at 50 deg. F. The steam ejector system uses this physical characteristic in producing refrigeration. Water in a closed system, under vacuum, is sprayed in a tank—the evaporator—where it partially evaporates, cooling itself by this process to the temperature of a very satisfactory cooling medium. The water thus cooled circulates through the coils over which the car air is moved by the blower fan. The heat to be removed from the car has been transferred to the water which returns to the evaporator where it is again cooled.

The vapors formed in the evaporator are removed by a jet of steam pulling on the evaporator. This jet entrains the vapors including the heat from the car. This mixture of steam and vapor pass through the diffuser and enter the condenser, where they are condensed. This condensate is removed from the condenser by a water operated purge, the same water later being used to spray over the condenser. Air is also blown over the condenser making it an evaporative condenser, and finally transferring the heat from the air inside the car to the air outside.

Choice of Air-Conditioning System

All systems, of course, have certain advantages. The advantage of the ice activated system is the low initial investment, small amount of power required, and dependable operation, as a block of ice never gets out of order, but frequent icing is necessary. The advantage of steam ejector equipment is the relationship of power required to the power available. The electro-mechanical system has the advantage of flexibility, as cooling can be obtained without an external source of power, as the power can be obtained from the batteries, which are charged, while running, by a generator.

All systems have disadvantages under certain operating conditions and these operating difficulties often can be avoided, or overcome, by selecting the system most suited for conditions encountered.

There can be no doubt that the air-conditioning of passenger cars has surpassed any other feature developed for the comfort of passengers and has made it possible for trains to be of more than a means of getting somewhere. Cooling will be demanded by the traveling public, in fact it will be taken for granted, as having heating and lighting in the past.

Temperature Control on Passenger Cars

By J. E. Morris

Vapor Car Heating Co., Inc., Chicago

Inside the car itself we must provide temperature comfort for every passenger. In doing this we must recognize the different zones that there are which are affected by varying conditions. The basic zoning of the car, of course, takes into consideration that the sunny side of the car receives heat from the sun itself and normally has about 8 deg. of heat from that source more than the shady side of the car. To offset this the two sides of the car should be under the control of separate ther-

mostats so that whichever side of the car is receiving the sun heat will not add more than a required amount of car heat to bring it up to a comfortable temperature.

Another zone in the car which influences passenger comfort is the end of the car opposite the recirculated grille because at this end of the car the cold air from door openings is pulled into the car and on to the passengers in the first seats. We recommend that this cold effect from the end doors be compensated by applying a

separate thermostat zone at that point. Another condition which should be taken into consideration is the comfort of passengers in the lounge or smoking rooms that are provided. These rooms are entirely separate spaces that are affected by conditions different than those in the body of the car and each should be considered as a separate thermostatic zone.

Five Thermostats Per Car

This means that an ordinary coach with a lounge room at each end would have two thermostats in the body of the car, one on each side, a third thermostat in the non-recirculated hallway and a separate thermostat in each of the lounge rooms, a total of five thermostats. The thermostats themselves consist of a mercury tube construction designed as an accurate thermometer. They have a platinum insert in the glass wall of the tube so arranged that when the temperature brings the mercury to make contact with the platinum wire a circuit is established to operate the relay, controlling valves or other equipment as required to maintain the desired temperature.

A unique feature of this tube comes through the addition of a secondary artificial heat-actuated bulb. This enables a single tube to operate at any desired temperature below its setting in accordance with the amount of artificial heat applied to this secondary insulated bulb. For instance, a tube made to contact at 80 deg. temperature of the surrounding air would operate as a 75 deg. tube if 5 deg. artificial heat were added to the secondary bulb. This also enables us to use the artificial heat as an anticipatory agent to prevent over-runs of temperature.

In addition to this, the overhead heat should be tied into the floor heating of the car and, in thinking of overhead heat, we think first of the overhead heat radiator. It should be designed so that it delivers approximately 20 to 25 per cent of the total heat load of the car. Its basic purpose is to temper the incoming air, and experience has indicated that it should be under the control of a thermostat that is set 1 deg. or 3 deg. below the floor heat thermostat so that the overhead heater delivers air into the car a little cooler than the rising floor heat. The radiator itself should be of the venturi design because its construction permits an even face temperature of the entire radiator under all conditions whether a minimum amount of heat is being taken from the radiator in mild weather or a maximum is being taken in cold weather. The venturi principle insures an absolutely even and instantaneous temperature over the entire face of the radiator under all cycles of heating valve operation.

The thermostat for the overhead heat radiator should be in the new automatic ventilation position. This means that this thermostat should be located in the path of the recirculated air towards the recirculated end about 5 ft. 6 in. from the floor. A thermostat in this location acts to control the heating temperature in the upper strata of the car. Latest applications have been designed so that the overhead thermostat is connected into the floor heat thermostat circuits so that when the overhead heat thermostat is satisfied it automatically cuts the floor heat thermostat temperature setting down approximately 4 deg. The purpose of this is to insure against floor heat building up in the car when the upper strata of the car is at a desired temperature. This is particularly important during loading and unloading of cars when end doors are open in mild weather.

To simplify the operation, inspection and maintenance of electrical circuits in the car, the postwar thermostats have been developed as complete plug-in assemblies, in-

cluding the mercury tube, relay, resistors, etc., in an easily removable unit.

The thought behind this is that this will permit correction of any difficulties with an individual thermostatic circuit by merely pulling the complete thermo-relay unit from its socket and replacing it with one which has been checked on a test board. This follows through the unit-part idea. It means that the electrician handling the work on the car does not have to be a master on reading circuit diagrams because he can replace the complete electrical assembly with one which is in good condition wherever any inspection or maintenance attention is required. It leaves the panel as a simple unit with only one or two relays on it in addition to the master switch.

This development brings about the fact that electrical maintenance work can be done without having to use men skilled in reading the complicated circuit diagram. It is only necessary for them to perform the mechanical function of replacing complete assemblies and the checking can be done on a master board in the electrical shop of any units that are removed.

The Control Panel

The description up to this point has covered the heating of the passenger car. Of course, the control itself is for the complete air conditioning. The control panel is designed so that it will change from heating into ventilation and on into cooling and back again automatically. The postwar control panel has on it a single switch that energizes the complete air conditioning equipment, both heating and cooling. There is an external thermostat in the duct influenced by outside air which increases the temperature setting of the heating thermostat approximately 4 deg. when the outside temperature drops below 15 deg. above zero. This same thermostat has another contact in it that increases the cooling thermostat setting by approximately 4 deg. when the outside temperature rises above 80 deg. In some cases we provide a selection switch on the panel with a normal position and designed to move towards a position marked "cooler" on one side of normal and "warmer" on the other side of normal, and this switch is designed to change temperature settings on all thermostats inside the car approximately 2 deg. from normal—this is to permit brakemen the privilege of selecting a variation from the basic temperature air required.

In addition to the heating and air conditioning controls of the car, there is the demand on the part of some of the railroads that humidity be taken into consideration. This can be done in either one of two ways—one is designated as our Sensible Heat Control and it consists of an additional bulb on the cooling thermostat that acts as a wet bulb. A combination of the effect of this wet bulb and the air activated dry bulb on the same tube gives an average temperature that is a combination of both wet and dry bulb temperature in the car and is known as a sensible heat temperature control. It is a very simple and practical arrangement and has been thoroughly proven in tests.

The other method of controlling humidity is by reheat and this is also accomplished simply by a change in the control panel itself which operates in conjunction with a split evaporator used with a mechanical type of air conditioning or with a dual cooling bulb control of a single evaporator for a steam jet or other type of air conditioning. This works along the lines of throwing in the overhead heat when the high temperature cooling tube is satisfied. Its result is to prevent the shutting off of the compressor in mild weather. It also provides a very effective control of the humidity within the car.



Modernized 4000-Class locomotive at the Des Moines enginehouse

Rock Island

Steam Locomotives Modernized

THE Chicago, Rock Island & Pacific is now capitalizing on a constructive locomotive improvements program whereby 100 modernized roller-bearing locomotives, supplemented by ten new locomotives, also equipped with roller bearings, are proving a vital factor in handling record-breaking passenger and freight traffic. This new and rebuilt steam power includes: ten heavy modern Class R-67 locomotives, Nos. 5100 to 5109, inclusive, received from the American Locomotive Company in 1944; 64 Class R-67-B locomotives, Nos. 5001 to 5064, inclusive, purchased in 1929 and subsequently thoroughly rebuilt and modernized at the railroad company's shops; 18 Class M-50-A locomotives, Nos. 4044 to 4061, inclusive, similarly rebuilt; 18 Class K-67-B locomotives, Nos. 2689 to 2713, not inclusive, also rebuilt and modernized. All of these locomotives, constructed originally by the same builder, are now equipped with Timken roller bearings and other modern improvements. The first two classes mentioned are of the 4-8-4 type, the third being a 4-8-2 and the fourth, or last, a 2-8-2.

This modern steam power has demonstrated its ability to keep trains rolling and also permitted attaining a number of highly-desirable operating objectives. The monthly mileage of certain classes of locomotives increased to 12,000 and some individual locomotives exceeded 17,000 miles. Annual mileages increased to 100,000 and 150,000. Overall repair costs decreased about 6½ cents a mile. In general, the average tire life between turnings doubled

Roller bearings and other improvements in 100 locomotives step up performance and cut the repair costs

and rod bushing life increased, in some instances, as much as ten times, largely owing to the more accurate and permanent fixing of driving-wheel centers through the application of roller bearings.

New 5100-Class Locomotives

The ten 5100-Class locomotives are all oil burners, with a fuel capacity of 5,500 gal., and a water capacity of 21,500 gal. Each locomotive and tender, coupled, has an over-all length of 108 ft. 10 in., and a total wheelbase of 95 ft. 11 in., other dimensions and weights being as shown in a descriptive article published in the *Railway Mechanical Engineer*, September, 1944. Roller bearings are used throughout on engine truck, driver, trailer and tender journals, and Multi-roll bearings are applied on the valve-motion pins. Other features include lightweight piston and lip-type packing, multiple-bearing crossheads with single guides, steam operated cylinder cocks and mechani-

cal lubrication throughout. To minimize rail and equipment shocks in high-speed operation, special attention was paid to counterbalancing all driving wheels and cross counterbalancing the main wheels.

These locomotives are used over extended distances, such as the 520-mile run between Kansas City and Dalt-hart, Tex. In the month of January, 1945, a typical 31-day month, the minimum mileage made by one of these

Mileage Between Tire Turnings—Rock Island 5000-Class Roller-Bearing Locomotives

| No. | New tires applied | Class of repairs | Date turned | Class of repairs | Mileage |
|------|-------------------|------------------|-------------|------------------|---------|
| 5001 | Feb., 1942 | 3-F | Apr., 1943 | 5 | 107,500 |
| 5003 | Oct., 1942 | 3-F | Dec., 1943 | 5 | 90,500 |
| 5006 | May, 1942 | 3-F | Aug., 1943 | 5 | 104,800 |
| 5007 | Jan., 1942 | 3-F | May, 1943 | 5 | 117,000 |
| 5009 | Dec., 1942 | 5 | Mar., 1944 | 5 | 100,150 |
| 5010 | Sept., 1941 | 3-F | Jan., 1943 | 5 | 122,000 |
| 5012 | Feb., 1943 | 5 | Aug., 1944 | 5 | 139,500 |
| 5013 | Nov., 1941 | 3-F | Mar., 1943 | 5 | 119,400 |
| 5014 | June, 1941 | 5 | July, 1942 | 3-F | 79,000 |
| 5041 | Aug., 1942 | 5 | Nov., 1943 | 3-F | 100,800 |
| 5042 | Sept., 1942 | 5 | Nov., 1943 | 3-F | 98,000 |
| 5043 | Dec., 1942 | 3-F | Feb., 1944 | 5 | 100,000 |
| 5045 | Dec., 1942 | 5 | Feb., 1944 | 3-F | 87,200 |
| 5049 | July, 1943 | 3-F | Oct., 1944 | 5 | 90,400 |
| 5053 | Jan., 1943 | 3-F | July, 1944 | 5 | 109,000 |
| 5054 | July, 1942 | 5 | Oct., 1943 | 3-F | 90,100 |

Average miles made by 16 locomotives 103,450
Average miles before modernization 50,000

locomotives was 8,141; two locomotives made over 10,000 miles; one, 16,714 miles; and one 17,261 miles. Up to January 31, one had accumulated a total of 85,077 miles in five months. The average cost of maintenance of all 10 locomotives since installation was 8.8 cents a mile.

5000-Class Locomotive Improved

The Rock Island purchased the first 25 5000-Class locomotives in 1929*. These locomotives proved unusually successful in handling tonnage trains at high speed and 40 more were delivered in 1930. After a survey by the mechanical and operating departments, it was decided to equip these locomotives with roller bearings on all driving wheel journals and to make certain other changes and improvements which would better adapt this power to meet the requirements of modern high-speed service.

Twenty-five of these locomotives were originally built

* See the December, 1929, *Railway Mechanical Engineer*, page 717.

with bar frames and 40 with one-piece cast steel beds. The driving wheel diameter was increased from 70 in. to 74 in. to facilitate higher operating speeds and, with no change in cylinder size or boiler pressure, a decrease in tractive force was anticipated. Experience indicated, how-ever, that the starting tractive force remained about the same owing to reduced friction of the roller bearings and an increased factor of adhesion.

Lightweight main rods and pistons, in conjunction with conventional crossheads, were applied to some of the loco-motives and the remainder are now being equipped. The Baker valve gears were equipped with needle bearings at all major points and the valve events modernized. Force feed chassis lubrication was supplied to all driver pedestal ways, feedwater pump, air compressors and guides in addition to the cylinrders and valve chambers. The stack diameter was increased from 19 in. to 24 in. and the exhaust nozzle diameter increased accordingly.

To facilitate longer runs, the tender capacity was in-creased from 15,000 to 20,000 gal. of water on all loco-

Mileage Between Tire Turnings—Rock Island 4000-Class Roller-Bearing Locomotives

| No. | Date turned | Class of repairs | Date turned | Class of repairs | Mileage |
|------|-------------|------------------|-------------|------------------|---------|
| 4048 | Dec., 1942 | 5 | Dec., 1943 | 5 | 135,800 |
| 4049 | Jan., 1944 | 5 | Dec., 1944 | 5 | 123,400 |
| 4050 | May, 1943 | 3-F | Aug., 1944 | 5 | 175,000 |
| 4051 | Aug., 1943 | 3-F | May, 1944 | 5 | 110,000 |
| 4057 | July, 1943 | A-3 | May, 1944 | 5 | 111,000 |
| 4058 | Mar., 1943 | 3-F | Feb., 1944 | 5 | 122,000 |
| 4060 | Nov., 1942 | 3-F | Oct., 1943 | 5 | 126,200 |
| 4061 | May, 1942 | 5 | Nov., 1943 | 5 | 165,900 |

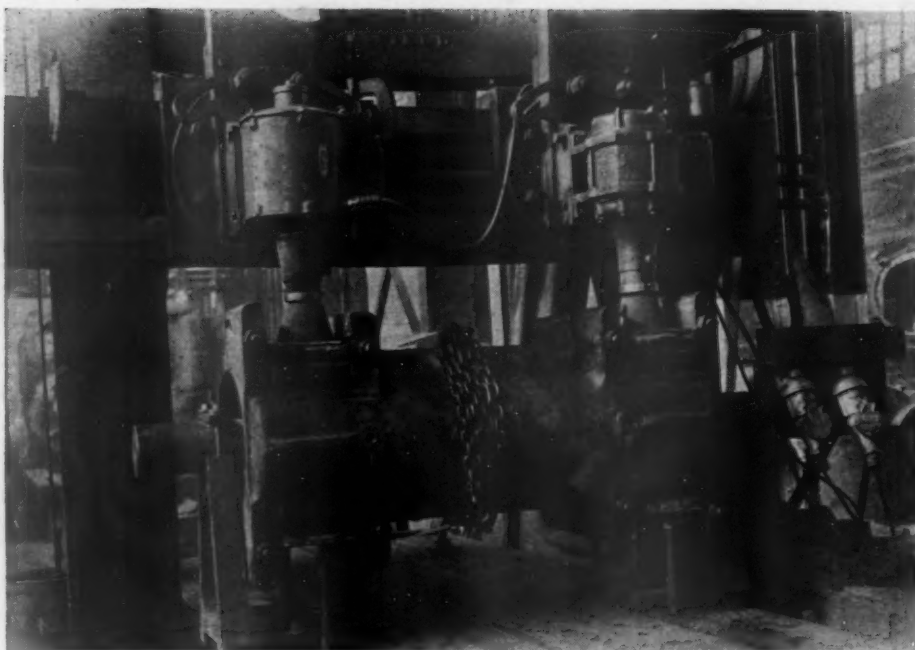
Average miles made by 8 locomotives 133,660
Average before being modernized 75,000

motives of this class, the rear portion of the tender being increased in height to make a larger tank. No change was made in the tender coal capacity of 20 tons, but, on 22 of the locomotives, equipped to burn oil, the fuel oil tank on the tender was increased in size from 4,100 to 5,000 gals. The original six-wheel trucks had sufficient reserve capacity to carry the extra load and no change was made except to install larger wheels 36-in. in diameter.

The best monthly mileage secured with 12 of these locomotives on the Oklahoma division in January ranged from 4,600 to 8,680 miles. The average cost of repairs since the last general shopping was 22 cents a mile and



One of the new 5100 Class locomotives ready to go



Housing support and double grinders used in truing worn pedestal ways



Finishing driving axle on a Cincinnati grinder at Silvin shops

in some instances these locomotives had made well over 200,000 miles since the last general repairs early in 1942. A check of the tire mileage on these locomotives indicates that before conversion they made from 45,000 to 50,000 miles between tire turnings. The provision of accurately fitted roller bearings and driving boxes tended to eliminate quarter slip and reduce wheel sliding with attendant substantial increase in tire life. The average mileage between tire turnings on 16 of these locomotives after conversion was 103,450 miles, as shown in one of the tables. Rod bushing life also was definitely increased.

Work Done on the 4000-Class

In addition to other mechanical improvements, the dome seams of 4000-Class locomotive boilers were reinforced, where necessary, in order to permit increasing the

steam pressure from 200 to 220 lb. cylinders were bushed from 28 in. to 26 in. and a current program calls for the application of new cast steel front bed sections. Roller bearings are applied to all drivers, engine trucks and trailer wheel, also within recent months to all tender truck wheels.

Lightweight main and side rods were applied, also Timken hollow piston-rods and Timken-type crossheads with aluminum shoes and block-tin faces. Since steam passages in the original cylinders produced an improved area ratio to the new reduced cylinder size, the valve events were changed to give larger areas through the bushing ports and improved efficiency for steam use at short running cutoffs. The new dimensions are as follows: lap, $1\frac{1}{2}$ in.; lead, $\frac{7}{32}$ in.; exhaust clearance, $\frac{1}{8}$ in.; maximum valve travel, $8\frac{1}{2}$ in.; steam port width, $2\frac{1}{8}$ in. The maximum starting cutoff was reduced from that on the original locomotives but was kept within limits to maintain good starting characteristics.

In conjunction with the higher operating speeds made possible through changes in the valve events, and the reductions in dynamic forces due to the use of lightweight reciprocating parts and rods, including eccentric rod, the eccentric throw circle was reduced to 20 in., and a lightweight design of eccentric crank applied. To assure against lost motion in the valve motion bearings, needle-type bearings were applied at all points except the rear end of the eccentric rod and the crosshead connection to the union link.

The original 4000-Class locomotives were equipped with heavy rectangular section rods, heavy crossheads with solid piston rods and a heavy design of piston with separate bull rings. The locomotives were balanced in the conventional manner, along the lines of 1915 A. A. R. recommendations and the static overbalances at the various positions were as follows: No. 1 driver, 193 lb.; main, 485 lb.; intermediate, 325 lb.; No. 4 driver, 168 lb.

When the main wheels were replaced, without changes to the running gear of the locomotive, a wheel design incorporating a crossbalance along the lines of the A. A. R. recommendation at that time was applied, the balance block being located at an angle of advance to the center line of the crank arm.

When the locomotives were equipped with lightweight

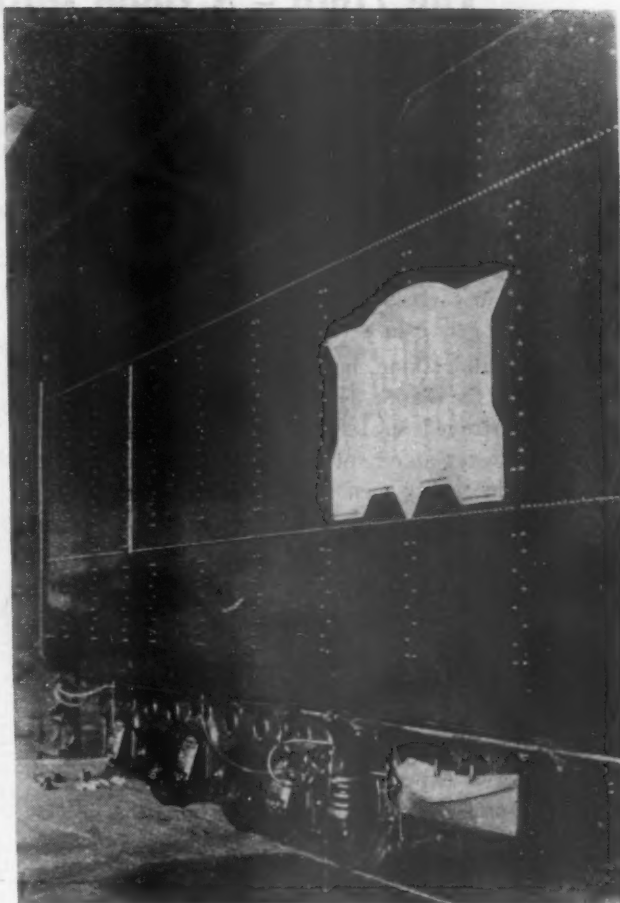
moving parts the locomotives were rebalanced. The main wheels crossbalanced and the other wheels balanced in the conventional manner, except that transverse out-of-plane forces were considered. Weights for the front and back of the main and eccentric rods were determined from the center of percussion. The amount of reciprocating balance in the main wheel was added in prior to final determination of the angle of advance of the counterbalance block.

The wheel counterweights were modified to produce the proper angle of advance and weight by means of tubed holes through the balance pocket. The overbalance provided at the various positions were as follows: No. 1, 138 lb.; main, 165 lb.; intermediate, 180 lb.; No. 4, 141 lb. The dynamic augment of the main wheel was reduced to 7,409 lb. at diameter speed.

Ten of the original 4000-Class, M-50 locomotives on the Rock Island division made from 7,000 to 8,400 miles a month in January and had an average cost of repairs of 21 cents a mile. Fifteen of these locomotives, converted to the M-50-A class and used on the same division in January, made 11,000 to 15,300 miles during the month and the cost of repairs was only 15.5 cents a mile or 5.5 cents less.

As regards tire mileage, a group of eight representative M-50-A locomotives averaged 133,600 miles between tire turnings, as shown in the second table, which may be compared with 75,000 miles before conversion. The accurately positioned driving wheels in conjunction with carefully quartered and stroked crank pins had the effect of increasing rod-bushing life. Whereas rod bushings sometimes had to be renewed after only 3,000 miles of service, bushings on the converted locomotives frequently ran up to three months or possibly 30,000 miles for the main rods and somewhat longer for the side rods.

A similar pattern of improvement was followed in the case of the K-68-B locomotives which retained the 28-in. by 30-in. cylinders and the boiler unchanged, but had the steam pressure raised slightly from 210 to 215 lb., thus increasing the tractive force from 67,000 to 68,000 lb. Roller bearings were applied to the drivers and eventually will be to the engine truck wheels. The tender capacity was increased from 10,000 to 14,000 gal. of water. There



The rear of the 5000-Class tender was increased in height

was no change in coal capacity, but on 12 locomotives equipped to burn oil, the fuel oil tanks were increased from 3,600 to 4,550 gal. New four-wheel tender trucks with 6 1/2-in. by 10-in. journals were installed.



Roller-bearing drivers and engine truck ready for wheeling the locomotives

The 716th - A 'Good Outfit With A Few Poor Men

A.P.O. 887

24 APRIL 1945

TO: THE RAILROAD MEN, THEIR FAMILIES
AND FRIENDS.

American railroad men who are charged with the safe and on-time delivery of millions of tons of freight each year are fundamentally honest and devoted in their attention to duty. It is their job to see that the receiver of the freight gets it in perfect condition and on time.

I cannot understand how, with their background, members of the 716th Railway Operating Battalion could have strayed so far from the principles which they have always stood for, unless, perchance, the accused were in reality men without railroad experience or background, but simply a cross-section of American citizenship drawn into the Army by induction, a proportionate number of which were assigned to the Military Railway Service units. I just cannot feel a group of railroad men had gone wrong to the extent that the reports from the trials and convictions seemed to indicate.

The railroads of America actually crippled themselves to give us experienced officers and a great many experienced enlisted men. In order to have the necessary railroad experience, most of these officers and men really had to be above Army age. Many of them served in the last war. Now with particular reference to the 716th Railway Operating Battalion, this Battalion is composed of 887 officers and enlisted men; only 349 of these were even questioned and 160 brought to trial, of whom almost one-half had had no railroad background. Those with railroad background who were brought to trial represented only three-tenths of one per cent of the total strength of the Military Railway Service in this theater. Of the 22 men tried and acquitted, 17 had railroad background.

One of the men convicted and sentenced to a long term was from my own home town, St. Paul, and reports from St. Paul indicate that this man was not a railroad man and that he had a police record before he went into the Army. I have not had a chance to check up on the previous record of some of the others, but I do know that it was most unfortunate, and, to me, definitely misleading that the 716th Railway Operating Battalion's name seemed to be used each time there was a conviction in connection with these black market operations, even though the man sentenced did not belong to the 716th Railway Operating Battalion.

I have no brief for a thief, but I have lived among railroad men all my life and know them to be fundamentally honest. The thing that I want the American public to understand is that neither this Battalion nor any of the American railroad men in the 67 units, and over 30,000 men, are thieves. They are conscientious rail transportation men who are as much interested in getting the supplies to the soldiers in the front lines,

their consumers, safely and on time, as they ever were back on a commercial railroad in the United States, where their bread and butter depended upon a continuation of that kind of service.

I have talked to too many of them and they look upon their responsibilities here and to their Big Shippers—the Services of the Army—and their consumers—the soldiers in the front-line trenches—with a higher degree of service standards than they have on the most competitive commercial railroads back home. In the United States their jobs depended upon successful, safe and on-time rail transportation. Over here, they know that their future, the future of their families, the future of their country, in fact, the future of the world, requires the same dependable rail transportation service for the Armies that they have always given the shipping public of the United States. They have given that unstintingly.

They know no 16-hr. laws over here. An engineer will work on a track if necessary and a conductor will help build bridges, while the "gandy-dancer" will try to run a locomotive if there is no engineer available. They are not thieves and they are not criminals, but they are American citizens with a pride and a love of their industry and their work, a mature realization of their responsibilities, and a devotion to duty that has been superb. They are pushing forward tens of thousands of tons of freight a day to their comrades in arms, the men of the Armies they are supporting, and I just cannot stand idly by and let an impression go unchallenged that they have so completely forgotten their American railroad standards and principles, as well as their American ideals, as to be guilty in other than a very small degree of the whole black-market operation, which fortunately have been nipped in the bud in time.

To the everlasting credit of the 716th Railway Operating Battalion and to the other battalions and units of the Military Railway Service in this theater, all of these men have gone steadily forward in doing their job of railroading for the Armies. Their morale is excellent and the 716th Railway Operating Battalion has just passed a rigid inspection with an excellent rating. The 716th's Bulletin of March 24 states, "The end of March is nearly here and still no venereal disease in the 716th." This indicates to me that they are good solid American railroad men, that they still have confidence and faith in themselves, in their unit, in their railroad industry and in America, and will not permit exaggerated and false accusations about them in any way to lessen their attention and adherence to duty, nor "slow them down" in doing their share of moving the freight forward to the Armies.

With kindest regards.

Sincerely yours,
CARL R. GRAY, JR.,
Brigadier General, USA
Director General

EDITORIALS

Mechanical Labor Conditions Critical

The critical condition of railroads as regards mechanical department labor is indicated by Railroad Retirement Board statistics showing a shortage on Class I roads, as of March 31, of 12,610 skilled trades journeymen and 11,054 skilled trades helpers and apprentices. In addition, there was a shortage of 788 coach cleaners and 7,950 shop laborers. Moreover, it is estimated that half of the mechanical forces now employed are relatively inexperienced and include substantial numbers of over-age men, teen-age boys and considerable numbers of women with no previous railroad experience and consequent limited capacity to perform this class of work.

On one typical large railway system, the manpower shortage on March 31 included 289 mechanics, 60 helpers, 52 apprentices, 79 laborers and 8 coach cleaners or a total of 488 men. This represented only 80 per cent of the shortage on March 31, 1944, but this indicated slight easing in the situation did not extend to all crafts, such as the machinists, boilermakers, etc.

One step taken to meet the shortage has consisted of promoting all apprentices upon completion of their apprenticeship, but a large proportion of those promoted have been inducted into military service and this includes practically all apprentices employed since 1940 who have been inducted on reaching the age of 18 before completion of the two years' training required for promotion.

Another step has been the up-grading of helpers of the various crafts to mechanics-tentative and assigning them to such mechanic's work as they were qualified to perform. There are 462 such men still in service. Many others so promoted have been inducted into the armed forces. At some points, the list of helpers qualified for promotion has been exhausted, while at other points all have been promoted for whom semi-skilled work within their capacity to perform can be provided. While helpers have been employed or up-graded from laborers in considerable numbers since 1940, little further relief through up-grading from this source can be expected.

A total of 800 laborers have also been up-graded, mostly to helpers of the various trades, but some to locomotive firemen, brakemen and yardmen. On this particular railroad, the supply of unskilled and semi-skilled labor has improved in general, except at shops and terminals in or near large industrial cities.

The prospects for the balance of the year point to some slow improvement in unskilled and semi-skilled mechanical labor conditions, which, however, continue to be critical. Even with the close of the European War, there is not much basis for anticipating a marked increase

in the supply of skilled mechanics. This problem, which has such a vital bearing on railway operation and the successful handling of the nation's war and civilian traffic, is still definitely before the War Manpower Commission and the local Selective Service Boards.

Safe Loading Of Freight Cars

Cars loaded for movement over American railroads have every likelihood of arriving at their destinations without damage to the loadings if certain minimum requirements for safe loading are followed. In a talk delivered before the Eastern Car Foreman's Association in New York, A. H. Keys, assistant superintendent car department, Baltimore & Ohio, and a member of the Loading Rules Committee of the Mechanical Division, developed this point at some length as he outlined typical situations in which the Loading Rules Committee had functioned. Mr. Keys stressed particularly the limitations upon the value of the work of the Committee which can arise through the failure of shippers or carriers to observe the rules. Although the rules are mandatory, instances have been known in the past where traffic considerations had led carriers to accept shipments not loaded in accordance with the rules. According to the speaker, such cases, when dealt with through the responsible officers of the carriers involved, have not been repeated. It is to be hoped that similar situations will not again arise when competition for traffic resumes under peacetime conditions.

No better argument for compliance with the rules as worked out by this committee could be presented than the wartime performance of the railroads in carrying a record freight traffic. The rules in general have proved adequate, necessary changes have been made promptly as need appeared. Military loadings were specially studied and prepared for before our entrance into the war and the uninterrupted flow of such shipments between army installations in this country and between arsenals and manufacturing points to our ports has earned for this committee the right to feel proud of its foresight in formulating the rules.

In the discussion which followed the presentation of the paper it became more than ever clear that observance of the rules meant safe movement of cars without the necessity for adjustment or transfers of loads. Instances cited from the floor of shifted loadings, etc., when discussed in the light of rule requirements proved to be cases in which the rules were not fully observed even when there was no evidence of intent to skirt or disregard the applicable provision for safe loading.

Other important and interesting things brought out by Mr. Keys were that the committee was ever ready to cooperate in the study of rule changes; that none of the rules are arbitrarily imposed; that, in every instance, the requirements represented minimum securements; and, most important, that the car inspectors throughout the country are, in the final analysis, the key men in the whole loading set-up. Under present conditions their burden is a heavy one but as they remain alert and require close adherence to safe-loading practices, war and other freight will continue to move safely.

Sixty Clear Channels

Release to the railroads of 60 clear radio frequency channels for train communication, as described elsewhere in this issue, means that the railroads will no longer be restricted by temporary experimental assignments and can proceed to develop space radio as well as carrier for this purpose. There are still a few hurdles for the railroads, but none of them insurmountable.

Committee 7 of Panel 13 of the Radio Technical Planning Board must continue to work with the Federal Communications Commission to develop engineering practice and operating procedure, and the railroads will be required to make application to the Commission for authorization to use specific channels and to the War Production Board for priority to purchase equipment.

The assignment of channels is the result of careful and thorough study on the part of the Commission and much credit is due to the work of Committee 7 and specifically to its chairman John L. Niese for presenting the railroad's case to the Commission. The assignments should be ample to fill railroad needs and it now remains with the railroads to avail themselves of the opportunities afforded by the assignments.

In the proposed allocations issue by the Commission on January 16, 1945, the railroads were assigned 33 clear channels in addition to some others to be shared. At the hearing held in Washington, February 28-March 2, 1945, the railroads offered objections to 60-kc. channels rather than 100-kc. channels, saying that the narrower band would entail difficulties and increase costs. In the final assignment the Commission stuck to the 60-kc. channel width, but increased the number of channels from 33 to 60. Apparently the Commission wishes the railroads to use 60-kc. channel widths, if this can be done practically under railroad operating conditions, but there would appear to be some latitude which might make it possible to appeal for wider channels if the narrow one proves impracticable.

Some technicians believe either AM or FM can be used practically for voice transmission on a 60-kc. channel. Others feel that the use of frequencies around 3,000 mc. should be worked out employing only FM. But whatever the ultimate or the best may be, the present assignments provide an opportunity for installing a railroad aid which in many cases may pay for itself in months. It will be a matter of several years,

conceivably six or eight, before sets in the 3,000-mc. range are developed and generally available. The change from 160 to 3,000 mc. would mean the scrapping of sets, but the savings to be made in any such interim period should be such that no one who wishes to use radio for train communication would be warranted in waiting for further development.

Wartime Lessons Will Guide Future Operations

With the shifting of traffic from the eastern seaboard to the west coast we will be imposing a traffic burden of increased proportions upon transportation facilities already loaded to capacity. The next 12 months will probably provide a test whether new operating methods and facilities developed in the 43 months of wartime traffic handling are as good as they appear to be—whether they have the flexibility for further expansion if necessary. Our transport machine has so far met practically everything that has been asked of it and in the process of meeting these demands lessons have been learned which if applied in time assure that the danger of failure during the remainder of the war will be remote insofar as motive power is concerned.

For many months we have been keeping more than 85 per cent of our locomotive inventory on the active list all the time but unfortunately the statistics dealing with the performance of motive power conceal effectively the cornerstone that has really held up the entire motive power structure—the 2,000 or more modern locomotives representing, on individual roads, as little as 30 per cent of the total inventory but operating as much as 50 to 60 per cent of the mileage.

The term "modern locomotive" as applied to steam power has been used rather loosely so that one pauses occasionally to ask what a modern locomotive is. Age alone does not necessarily indicate whether a locomotive is modern or otherwise, for it is conceivable that there are new locomotives built that are not modern. A modern locomotive can be recognized by good design proportions, with a boiler that has just a little more capacity than the maximum job it is called upon to do; one equipped with roller bearings and mechanical lubrication to all important working parts.

If one is in doubt as to the value of these factors, there will be found elsewhere in this issue two articles; one dealing with a group of 4-8-4 locomotives on the Rock Island and another with a group of locomotives of the same wheel arrangement on the Norfolk & Western. The Rock Island locomotives have truly been the backbone of traffic handling on that road for many months and the figures which are shown relating to actual performance data are evidence that locomotives so equipped actually can double the mileage between tire turnings. The Rock Island locomotives averaged 133,600 miles between tire turnings and the N. & W. locomotives, used entirely in passenger service handling heavy trains over mountain grades, averaged 119,000 miles. When one considers the expense of dropping

wheels and turning tires it is not a difficult matter to translate these performances into terms of savings, not only in time but in money. Mechanical men are always interested in costs and beyond mention of the repair costs for these groups of locomotives on the two roads—an average of 21 cents, 15.5 cents and 11.54 cents per locomotive mile—it is hardly necessary to amplify a bit of evidence that indicates the relative value between a modern locomotive and one built 20 years ago.

In addition to the outstanding job done by the new steam locomotives there has been, in many respects, a still more striking job done by the Diesel-electric road locomotives in both passenger and freight service. In 1944 the Diesel-electric road locomotives, in freight service alone, accounted for approximately 20 million freight locomotive miles. When this is compared with the approximately 9 million freight locomotive miles operated in 1943 it can be seen that the Diesel is an influence of rapidly increasing proportions in the freight transportation picture.

The above high spots of performances that are amplified in considerable detail in the two articles referred to are but samples of the results of many developments in motive power during the past few years and during the war particularly the railroads have learned important lessons which place them in possession of operating and mechanical facts invaluable in guiding future policies. The next few years will be critical years when the pressure of competition with other forms of transportation may demand more study and effort than has the handling of war time traffic. Manufacturers have shown the way to the future with a multitude of new ideas, and if the railroads will but remain alert to the exploitation of future developments their ultimate success seems assured.

Use of Treated Car Lumber Increased

A report on the uses of treated wood for car lumber, prepared by a committee of the American Wood-Preservers' Association, as presented elsewhere in this issue, gives a detailed list of more than 5,400,000 ft., board measure, of treated wood used in 1944 by 11 roads. This important modern structural material was employed for the building or repair of freight cars, including creosoted and salt-treated material for decking, nailing sills, coal-car and stock-car sides, running boards, saddle blocks, stringers, furring, stock-car superstructures, ballast-car sides, and floor racks and ice bunkers in refrigerator cars.

The amount of treated lumber utilized was approximately 2,400,000 ft. more than that reported for 1943. In addition, three roads reported an unspecified amount of treated lumber used for the construction or repair of 1,540 cars, and two other roads reported favorably on treated material for certain members.

A program employing pressure-treated wood in the heavy maintenance reconstruction of certain classes of freight cars has just been initiated by the Pennsylvania.

Decking, floor supports and running boards have been ordered for 100 box cars and running boards for 25 stock cars, all pressure treated with chromated zinc chloride, as well as creosote-treated roofing and flooring for the stock cars. Chromated zinc-chloride-treated running boards are also being supplied for 500 new box cars for another eastern railroad.

NEW BOOKS

NEW METHODS FOR SHEET METAL WORK. By W. Cookson, M. Inst. Met., A. M. I. Prod. E. Published by The Technical Press, Ltd., Gloucester Road, Kingston Hill, Surrey, England. 208 pages, 5 in. by 8½ in., illustrated. Price, \$3.

This third edition of New Methods for Sheet Metal work is a practical textbook for apprentices, sheet metal workers, platers and draftsmen engaged in engineering, aircraft, shipbuilding, and other industries. The book modernizes and simplifies geometrical development procedure and puts the practice of laying-out patterns on a more exact basis than hitherto believed possible by using calculation methods to insure dimensional accuracy of the finished product. The chapters which deal with the development of sheet-metal patterns by mathematical formulas, particularly as applied to triangulation problems, are believed to be the first ever published. Examples given are typical of actual jobs.

THE MODERN GAS TURBINE. By R. Tom Sawyer. Published by Prentiss-Hall, Inc., 70 Fifth avenue, New York. 250 pages, 6 in. by 9 in., 131 illustrations. Price, \$4.00.

The gas turbine has been very much in the limelight during the past three or four years and yet because of the war much of the development work that has been done during that period has either been done without any great amount of publicity or has mainly been the subject of papers before technical societies. The gas turbine, in its several forms, appears to have great possibilities in the future and there is considerable curiosity concerning its principles and applications both on the part of the layman and the engineer in industry. With the idea of satisfying the needs of both these groups the author of this non-technical work has co-ordinated the available data on the subject into a book that is well organized and extremely readable. From the opening chapters dealing with historical background, through chapters which present the fundamentals of principles and design and on into that part dealing with the many practical applications of the gas turbine the author has kept in mind the diversity of interests of the reader to such an extent that irrespective of whether he be in railroad, marine, public utility or aeronautical work his questions will find an answer. Of particular interest to the railroad man is the chapter on the gas-turbine locomotive. In it are discussed the existing applications, both in this country and Europe, of the gas turbine as a supercharger for Diesel engines and as a prime mover.

THE READER'S PAGE

Turbine vs. Reciprocating Engine

TO THE EDITOR:

The editorial in the April issue on "How High a Price Can We Afford to Pay?" is appropriate but, possibly, a bit premature. The real economies of a turbine-driven locomotive will not be known until time determines its maintenance cost.

The last paragraph expresses the hope that the designers of boilers will concentrate their efforts on solving boiler problems so that a better conventional locomotive will result. The need for such an improved boiler is paramount, but if the ultimate is attained the steam generated will be too high in temperature to permit its use in a reciprocating locomotive. Beyond current temperatures of 750 deg. F., lubrication of pistons becomes difficult, if not impossible. On the other hand, the turbine can use 900 deg. steam at pressures well over 1,000 lb. per sq. in. with efficiency. The improvement in boilers will probably, if realized, hasten the obsolescence of the reciprocating locomotive.

In power generating stations, pumping stations and other large land power uses the reciprocating steam engine became obsolete with the development of efficient turbines. The efficiency of the modern powerhouse is the result of a series of developments involving all of the equipment in the plant from boiler feed pumps to condenser hot well. The "choo choo" may not share in many of these developments because of restricted height, width and length and because of a certain amount of vibration. Neither can it draw a continuous supply of cooling water from a stream so that steam can be condensed and returned to the boiler as clean feedwater.

With the elimination of the steam engine in bulk power generation and ship propulsion, there is wonder that it could have continued to exist on locomotives. The history of locomotives is replete with advances that have permitted increases in power and in efficiency, yet all have been accomplished without increasing the track gauge. There must be an eventual limit to the amount of steam that can be generated in a single unit within standard railroad clearances and wheel base limitations, and when that limit is reached the answer to "more power" will be to use more efficiently the steam obtainable from the maximum boiler.

Due credit must be given to the designers and builders of the locomotives which have moved war traffic in almost incredible amounts. Certainly the locomotive builder, along with the railroad, deserves the heartfelt thanks of 130 million people.

The conventional locomotive, thermally, is not an efficient machine. The firebox is limited in area so that

fuel burned, in pounds per square foot of grate per hour, is very high. The boiler absorbs as much heat as possible from the hot gases in the few seconds required for these gases to pass into the smokebox, but heat lost out the stack is still excessive. Water used is the best obtainable and is usually treated; nevertheless, every bit of sediment going into the boiler remains there to obstruct heat transfer. The heavy draft carries some of the fuel out of the stack. Poppet valves and variable cut-off have improved engine efficiency but in overall efficiency much is to be desired.

As in the power plant, and on ships, the turbine has now taken its place on a steam locomotive. Who would cite reasons why it cannot be as outstanding in locomotive service as it has been in power plants and on ships? Marine experience has proved that turbines and gears operate at full power for long periods without other attention than lubrication. Many marine geared turbine propulsion units are operating that have not even been opened for inspection for five years. It would be too much to hope that the first geared turbine locomotive built in this country—and one of the largest locomotives of any type ever built—would operate for years without developing at least some minor defects.

The fourth paragraph of the editorial expresses the fear that the use of turbines will increase the first cost of a steam locomotive until it practically equals that of a Diesel, and that a complexity of wearing, high priced parts will wipe out another advantage that such a locomotive might have as compared with a Diesel. On the basis of the actual drawbar horsepower delivered at the rear of the tender there is no reason why the price per drawbar horsepower of the non-condensing steam-turbine locomotive, built in the same quantities as Diesels, should not be materially lower than the Diesel. As for the complexity of parts, a turbine consists of one revolving part, turning in two bearings with a thrust bearing to keep it in proper axial location. The gearing and drive contain a few moving parts that might be expensive to replace, but certainly will not be expensive to maintain.

The gas turbine has more appeal, probably, to the transportation industry, than for any other application. The railroads, however, with much of their motive power thoroughly worn out in war service, cannot wait indefinitely for a gas turbine. The motive power need is current. In the meantime, the steam turbine locomotive may fill the needs of the railroads. It doesn't sound like a locomotive, but it does look and smell like one. And, if other applications can serve as a criterion, it will not only run well but will be economically sound.

M. KENNEDY

Westinghouse Electric & Manufacturing Co.

Railway Mechanical Engineer
JUNE, 1945

With the Car Foremen and Inspectors

Reclamation of Car Repair Material

According to a circular letter issued under date of April 28 by the A.A.R. Mechanical Division, some railroads and private car owners are purchasing from secondhand dealers various items of car-repair material, particularly truck side frames and couplers which have been reclaimed by welding without proper heat treatment and marking as prescribed by Interchange Rule 23, and have applied such material to their own as well as foreign cars.

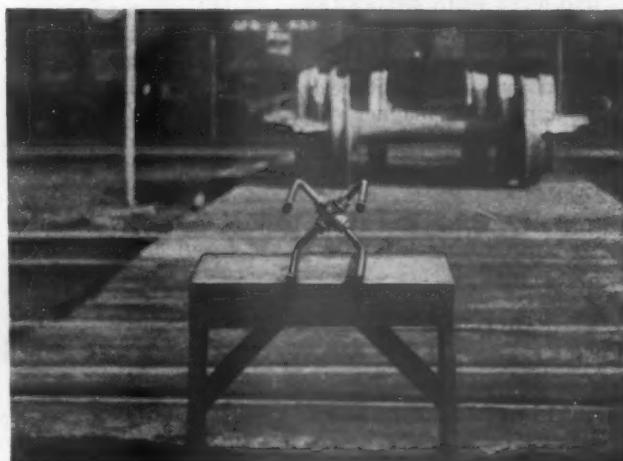
Investigation by the Mechanical Inspection Department of the Division has developed that side frames and couplers are being reclaimed in certain instances without the heat-treating facilities required for proper handling of the work.

The Mechanical Division emphasizes the obligation of car owners and railroads who desire to purchase such reclaimed material for use on cars operating in interchange service to assure themselves that the dealer has the necessary equipment to perform the reclamation and that the work is being done by the methods outlined in the rule.

Cleaning Car-Wheel Journals

The time required for the removal of the rust-inhibiting agent applied to car-wheel journals has been shortened at the Glenwood car shop of the Baltimore & Ohio. The procedure followed is being made standard for all shops where steam lines are located near wheel tracks.

Instead of using solvents for the removal of the rust-inhibiting coating, this material is now softened sufficiently by live steam so that it is readily wiped from the highly-finished journal surface. The illustrations show the steam-



Live steam is directed against car-axle journals by this assembly before rust-inhibiting agents are wiped from the journals

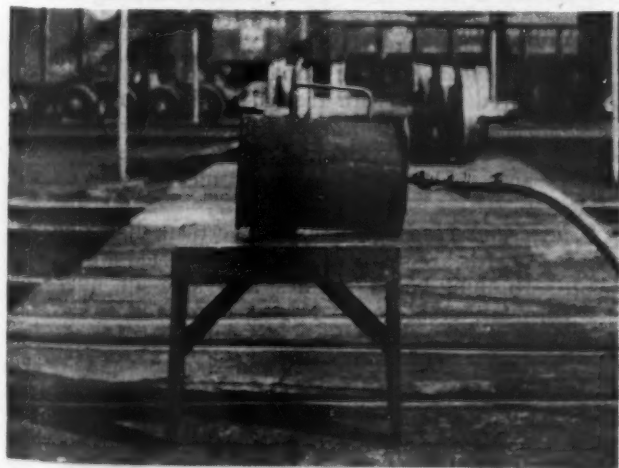
ing device which consists of four perforated pipes attached to a manifold which is, in turn, connected by a hose connector to a steam line. The holes in the four pipes are so located that live steam is directed against every part of the journal surface. The steaming unit is covered with a sheet-metal casing which is closed at the end where the steam line enters and which is long enough to fit against the plate of a wheel to give sufficient closure on the opposite end to retain steam for the purpose intended. Journals are steamed for about 45 sec. after which they are readily wiped clean and dry without the use of solvents.

The steaming unit shown is only the experimental one made up of pipe and fittings. Fittings are no longer used, pipe sections being welded directly to the steam manifold.

Air Brake Questions and Answers

HSC Equipment on Passenger Cars and Diesel A and B Locomotive Units Brake Application

275—Q.—What happens in event of straight air pipe breakage? A.—In the event of straight air pipe breakage or abnormal magnet valve operation, which would result in loss of auxiliary reservoir air, spring 10 will seat valve 5 and thus retain 75 lb. auxiliary reservoir pressure. This is sufficient to permit an effective pneumatic brake application. The brake valve rotary valve remains in charging position for service applications of the HSC system. Thus the brake pipe pressure is higher on the face of the control valve service piston during applications than auxiliary reservoir air back of the piston, as auxiliary reservoir air is reduced into the straight air pipe at the 21-B magnet valves. Consequently, the service and emergency pistons remain in release position during HSC electro-pneumatic service brake application.



Casing used in connection with the B. & O.'s steaming unit for cleaning car-axle journals

276—Q.—On the *A* locomotive, what is the effect when pressure is built up in the straight air pipe? A.—Referring to Fig. 32, choke 11 controls the flow of air to chamber *A* on the face of the master controller release diaphragm 18a, and as the pressure is built up in the straight air pipe it acts on the release diaphragm in opposition to the control pipe pressure in chamber *B*.

277—Q.—What is the purpose of the pressure in chamber *B*? A.—It acts on the application diaphragm 18 and when the air pressure acting on both diaphragms, (18a and 18) is balanced, spring 23 moves the diaphragm shaft 32 and lever 40 to lap position.

278—Q.—What is the result of this movement? A.—The application wire contact (Appl) is broken, the application magnet circuit is de-energized, and spring 35 closes application magnet valve 34 of the 21-*B* magnets; spring 24 remains compressed however, so the release contact (Rel.) of the master controller remains closed.

279—Q.—With the release contact closed, what happens? A.—The release wire and 21-*B* release magnets are energized, which holds release magnet valve 62 on its seat.

Increasing Control Pipe Pressure

280—Q.—What is the result of magnet valve 62 being held on its seat? A.—Pressure in the straight air pipe is retained to equal the pressure in the control pipe.

281—Q.—What occurs when control pipe pressure is increased by further brake valve handle movements? A.—Straight air pipe pressure throughout the train is increased an equal amount by the application operation of the master controller as described.

282—Q.—On the locomotive, during an application of the brake, what is the course of the air from the No. 21-*B* magnet valve? A.—Referring to Figs. 30 and 32, straight air pipe pressure flows from the 21-*B* magnet valve to connection 8 of the D-22-ER control valve, thence through passage 8 in the application and release portion, cavity *n* in the application slide valve 257, and passage 8a to the chambers above double check valves 263 and 263a.

283—Q.—As the pressure above the double check valves holds them on their lower seats, what is the result? A.—Check valve 263a closes off passage 20 leading to the independent application and release pipe, and independent brake valve exhaust. Check valve 253 closes off passage and pipe 3 leading to the displacement reservoir and service portion exhaust passages 3b and 10 through release slide valve 112.

284—Q.—How does the straight air pipe connect up with the relay valve? A.—This flow continues through passages 16c and 16 to the FS 1864 or F 1864 relay valve.

285—Q.—Describe the flow of straight air pipe pressure from the No. 21-*B* magnet valve during an application of the brakes. A.—Referring to Fig. 28, straight air flows from the 21-*B* magnet valve to the D-22-BR control valve entering connection 8 and passages 8 and 8a and moving double check valve 288 to its right hand seat, thereby sealing off passage 3, which is open at this time through cavity *Q* of the release slide valve 11 to exhaust passage 10.

286—Q.—What does this movement of the check valve accomplish? A.—Movement of the check valve uncovers passage 16a through which straight air pipe pressure flows to pipe 16 and thence to chamber *A* of the K-3 switch of the FS-1864 relay valve.

287—Q.—How does this effect the K-3 Switch? A.—The switch diaphragm 4 is deflected at about 10 pounds pressure against the tension of spring 9, moving collar 6 and closing contact finger 20 across contact holders 28

and 28a, thus closing the battery supply wire to the speed governor relays.

288—Q.—How does the speed governor react to the speed of the train? A.—The speed governor thereafter energizes or de-energizes the three magnets of the FS-1864 relay valve on each car in accordance with speed.

B Unit Relay Valve

289—Q.—How is the relay valve on the "*B*" locomotive unit controlled? A.—From the speed governor on the *A* unit.

290—Q.—Describe the flow of control pipe air from the FS-1864 relay valve to the magnet and diaphragm portion. A.—Air from the control pipe 16 flows through passage 16 and strainer 17 to the magnet portion and to the diaphragm. In the diaphragm portion, the air from passage 16a flows to the spring chamber of check valves 51, 51a, and 51b, thence to chamber *A* on 40 per cent diaphragm 60.

Treated Car Lumber*

An increased use of treated car lumber in 1944 is reported by individual railroads as follows. All figures are expressed in feet, board measure.

St. Louis-San Francisco.—Creosoted decking, 1,756,000; salt-treated decking, 272,000; creosoted nailing sills, 234,000; creosoted coal-car sides, 673,000; salt-treated running boards, 52,000; total 2,987,000.

Louisville & Nashville.—Creosoted car decking, 198,645; creosoted saddle blocks, 51,645; salt-treated running boards, 467,708; total 717,998.

Denver & Rio Grande Western.—Creosoted stock-car decking, 170,750.

Atchison, Topeka & Santa Fe.—Creosoted car decking, 254,965; creosoted stringers, 3,336; creosoted tender decking, 10,394; creosoted furring, 8,183; total 276,878.

Texas & Pacific.—Salt-treated stock-car superstructures, 176,000; salt-treated ballast-car decking and siding, 186,000; creosoted stock-car decking, 10,000; total 372,000.

Wabash.—Creosoted hopper-car flooring, 400,000.

Missouri Pacific.—Creosoted stock-car decking, 100,000.

American Refrigerator Transit.—Salt-treated ice bunkers and floor racks, 351,000 ft. b.m. in 1943; 229,000 in 1944.

Wheeling & Lake Erie.—Salt-treated running boards, kiln dried after treatment, were used on new cars and for maintenance, 71,000.

Illinois Central.—Three hundred and fifty stock cars were repaired partly with treated lumber, completing a program started in 1943 when 800 stock cars were repaired. All decking and nailing stringers were creosoted. Roof boards, side slats and other members were salt treated.

Delaware & Hudson.—Box-car vertical sheathing and running boards are salt treated and kiln dried after treatment. Running-board saddles and side-sill fillers on box cars are creosoted. For open-top cars, creosote treatment is used on flooring, floor nailers, hopper supports, slope supports, slope and hopper plank and copings.

Western Maryland.—Steel-sheathed box and automobile cars are to have salt-treated lining and flooring.

* Report of Committee 7-11 "Uses of Treated Wood for Car Lumber," prepared for the April 24, 1945, annual meeting of the American Wood Preservers' Association.

Creosote, 6-lb. distillate treatment, steamed for three hours after treatment to provide clean surfaces, is used for flooring flats and gondolas.

Lining and side decking of locomotive cabs, decking between locomotive tender tank and frame, lining for cabooses and some running boards for box cars are salt treated. Lining is kiln dried to 10 per cent; flooring to 15 per cent moisture content after treatment.

Pennsylvania.—In November, 1944, the Pennsylvania issued instructions and specifications for the treatment of car lumber. The initial program covers the rebuilding of wooden parts on 100 box cars of the X26 type and 25 stock cars of the K7 type. All material to be fabricated before treatment.

Lumber required for the 100 box cars includes 131,250 board feet of flooring, 11,214 board feet of floor supports, 5,612 board feet of floor fillers, 9,056 board feet of longitudinal running boards and 2,100 board feet of latitudinal running boards; a total of 159,232 board feet. This lumber is all southern yellow pine treated with CZC to a retention of $\frac{3}{4}$ lb. of dry salt per cu. ft., kiln dried after treatment and before shipment to the car repair shops.

Material required for the 25 stock cars includes 32,812 board feet of flooring, 2,803 board feet of floor supports; 1,403 board feet of floor fillers; 2,274 board feet of longitudinal running boards; 495 board feet of latitudinal running boards, and 95 board feet of end battens—a total of 39,882 board feet. This lumber is also southern yellow pine. The flooring, floor supports, and floor fillers are treated with distillate creosote to a retention of 6 lb. per cu. ft. and steam cleaned. The running boards and end battens are treated with CZC to a retention of $\frac{3}{4}$ lb. of dry salt per cu. ft. and subsequently kiln dried.

Chicago, Burlington & Quincy.—During 1943 1,190 stock cars were repaired using 24,628 pieces of 2 in. by 6 in. by 8 ft. $10\frac{3}{4}$ in. and 15,992 pieces of 2 in. by 6 in. by 9 ft. $7\frac{3}{8}$ in. treated decking. Last year in building 200 new stock cars there were used 420 pieces $1\frac{1}{2}$ in. by 4 in. by 8 ft. $11\frac{1}{2}$ in. treated decking; 10,917 pieces $1\frac{3}{4}$ in. by $7\frac{3}{4}$ in. by 8 ft. $11\frac{1}{2}$ in. treated decking; 2,107 pieces $1\frac{3}{4}$ in. by $7\frac{3}{4}$ in. by 9 ft. $7\frac{1}{2}$ in. treated decking.

Additional treated material would have been used if it could have been secured in time for framing and treating and still maintain the stock-car-building program.

Service Records

Missouri-Kansas-Texas.—We have no special record of treated lumber used on our cars. Rather we are guided by inspections and observations. We have found that treating decks and nailing stringers on open-top cars prolongs very materially the life of these parts, more than doubling it. Under ordinary conditions we use treated black gum for the decks and where breakage does not occur through use of clam shells, our maintenance charges have very materially been reduced.

Great Northern.—In 1925, we had 500 stock cars, Nos. 53500 to 53999, built at the Siems Stemble Plant, St. Paul, Minn. These cars had wooden side sills, end sills, body framing, flooring and roofing creosote treated. There has been very little replacement of parts because of decay failures. This means that the life of end sills, side sills and side plates in particular was doubled or tripled, compared to untreated materials. This is a fair criterion of what may be expected from the treatment of wooden parts that are highly subject to decay failures.

Atchison, Topeka & Santa Fe.—The creosote treatment we have used has caused lumber to resist decay better than untreated lumber and we can increase life of this lumber from six to eight years by treating it. On some of our flat cars where we applied full creosoted decking using the Rueping process, the life of this decking was 12 to 15 years, compared with 4 to 6 years for untreated decking.

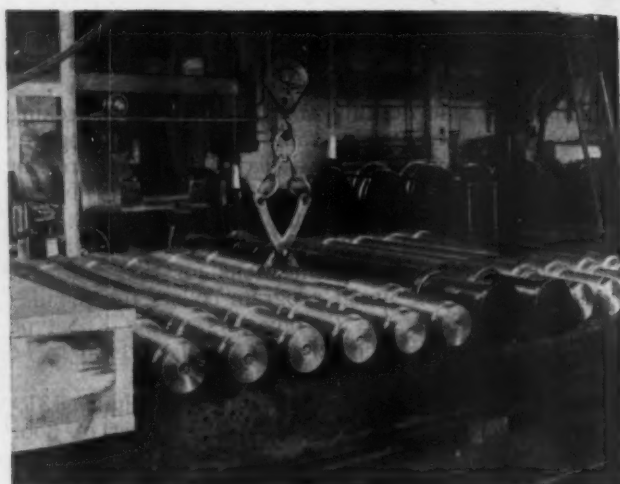
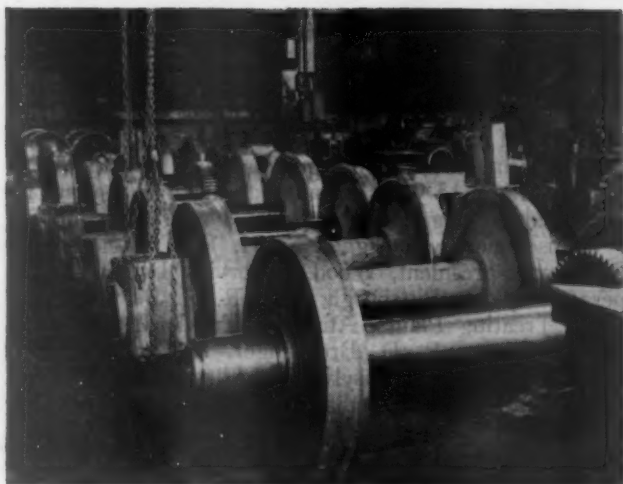
(This report was signed by H. R. Condon (chairman), vice-president, Wood Preserving Division, Koppers Company, Pittsburgh, Pa.; R. S. Belcher, manager, Treating Plants, Atchison, Topeka & Santa Fe, Topeka, Kan.; P. D. Brentlinger, resident inspector, Forest Products, Pennsylvania Railroad, Philadelphia, Pa.; C. M. Burpee, editor, Railway Engineering & Maintenance Cyclopedia, Chicago; R. F. Dreitzler, secretary-treasurer, West Coast Wood Preserving Co., Seattle, Wash.; D. R. Elmore, assistant to general manager, Fruit Growers Express Co., Washington, D. C.; R. C. Enste, assistant lumber agent, Baltimore & Ohio, Baltimore, Md.; T. J. Flynn, American Lumber & Treating Co., Jacksonville, Fla.; B. M. Goodwin, district manager, Wood Preserving Division, Koppers Company, Montgomery, Ala.; G. C. Hannaway, vice-president, T. J. Moss Tie Co., St. Louis, Mo.; L. W. Kistler, superintendent, Treating Plants, St. Louis-San Francisco, St. Louis, Mo.; E. H. Rieman, E. I. du Pont de Nemours & Co., Inc., Grasselli Chemicals Dept., Wilmington, Del.; C. S. Sizemore, assistant manager, Forest Products Bureau, Illinois Central, Memphis, Tenn.)

Machining Car Axles

The problem of machining axles for modern high-speed car equipment and Diesel locomotives is vastly different from the former practice of machining car axles, many of which required only rough turning between the wheels and could be finished in a center-drive axle lathe in one hour or less per axle. The severity of the service to which modern streamline equipment is put requires particular attention to the surface condition of all highly stressed steel parts and some roads follow the practice of grinding axles all over after being machined, also rolling or burnishing fillets, to remove any surface imperfections which might be the cause of progressive fractures.

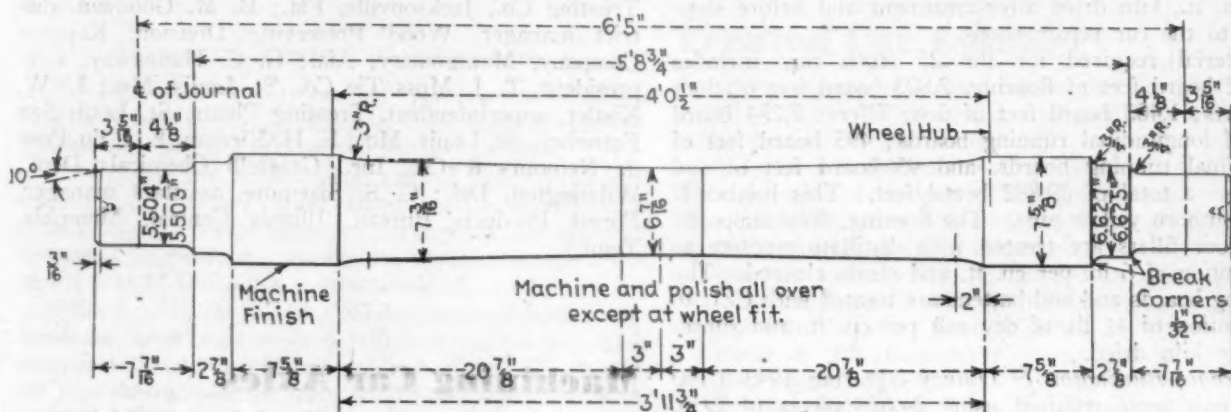
In the case of the Rocket trains of the Chicago, Rock Island & Pacific, a method of machining has been developed and is now being followed at the 47th Street, Chicago, shops which utilizes tungsten-carbide tools in a modern lathe to produce exceptional accuracy and smoothness of finish, so that subsequent grinding is not necessary except to meet some other requirements such as the application of roller bearings. In the entire operation of machining these axles, however, emphasis is placed on accuracy and a high degree of finish at some sacrifice, if necessary, in production.

Rocket car and power unit axles are machined at the Rock Island shops on an American 24-in. by 8-ft. heavy-duty engine lathe, driven by an electric motor with push-button control and equipped with a 24-in. four-jaw independent chuck, steady rest and profile attachment for use in machining the double taper on axles. In machining axles on this engine lathe, using tungsten-carbide cutting tools, the spindle speed is 162 r.p.m., or 365 ft. per min. surface speed, with .012 in. feed in roughing. For finishing, the spindle speed is 228 r.p.m.,

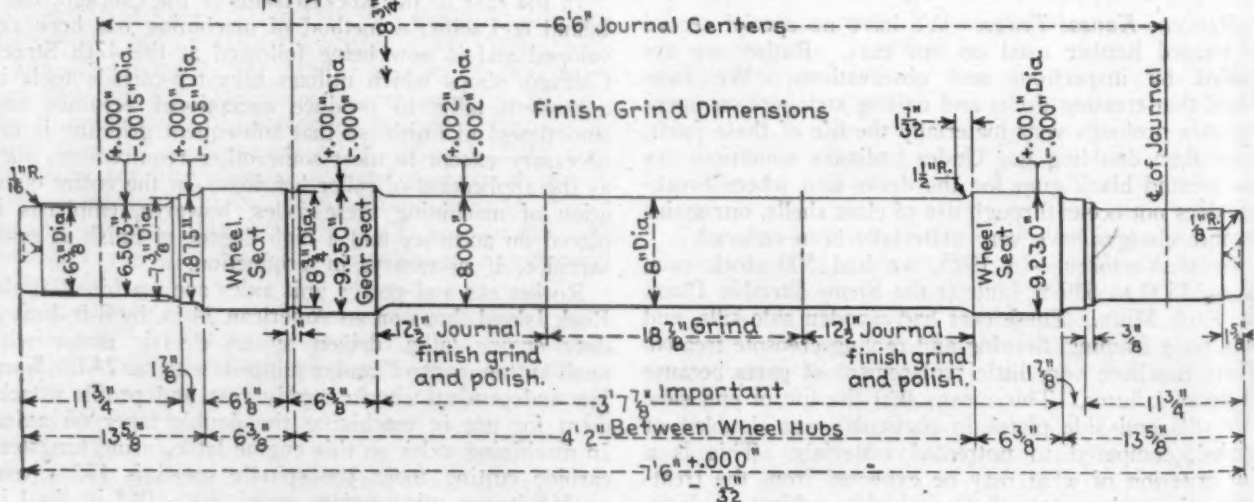
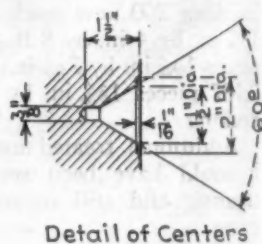
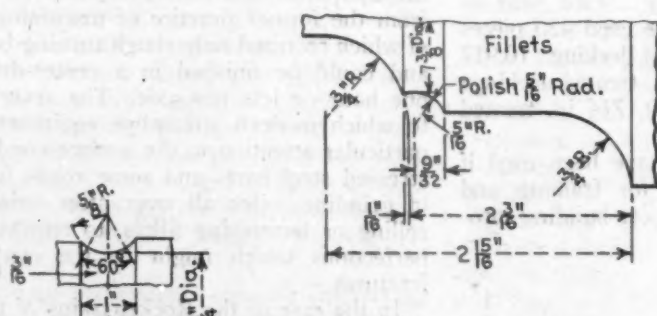


Wheels and axles which have been turned and mounted ready for service under streamline train equipment

Completed axles machined and assembled ready for use at the 47th Street shops



Roll bottom
of groove this
distance with
roller approx.
contour radius

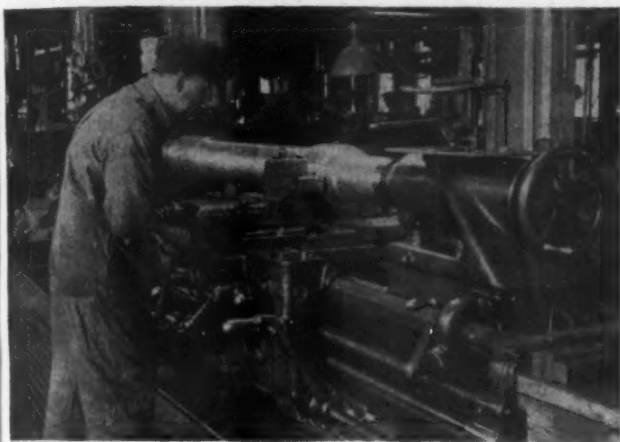


(Above) Finish dimensions of Rocket car axle with 5-in. by 9-in. journals — (Below) Rocket Diesel locomotive axle

or 478 ft. per min. surface speed, with a feed .006 in. per revolution.

Cutting tools used on this lathe are ground on a Hammond bench type grinder, shown in one of the illustrations. The 100-grit diamond-impregnated wheel on the left is a 6-in. plain cup-type wheel with $\frac{3}{4}$ -in. rim used for grinding cutting tools to standard rakes and clearances as follows: front relief, 6 deg.; side relief, 4 deg.; side rake, 8 deg.; back rake, 0 deg. The tool is offset 23 deg., right or left, which includes the side rake. The tool bit is made of tungsten-carbide steel, milled and brazed. It is ground the same both for roughing and finishing cuts, except that a somewhat softer alloy is used for the former.

An important feature of tools used in this high-speed



The highly polished axle end is secured with a tungsten-carbide cutting tool

turning with light cuts is the chip breaker groove, which is ground on the 4-in. diamond wheel at the right. This wheel has a $\frac{1}{16}$ in. diamond-impregnated square face with corners chamfered $\frac{1}{64}$ in. A 250-grit wheel, operating at 3,450 r.p.m., is used. The chip breaker groove is ground just back of the cutting edge and serves to break the chip as it curls off the axle. A slightly deeper and wider groove is required for roughing than for finishing cuts.

Tungsten-carbide cutting tools ground in this way are maintained with keen cutting edges by means of a diamond hone and require about one grinding per 8-hr. day. Under the high surface speed used in this operation, a heavy stream of coolant is required to keep the tool temperature within the desired limits.

Carbon-steel axles are received from the steel mill, normalized, tempered and rough-turned about $\frac{1}{8}$ in. large in diameter by $\frac{1}{8}$ in. longer than finish blueprint size. In operation, the axle is put between centers in the engine lathe, being driven by a face plate and lathe dog on the left end, with a roller-bearing center in the tail stock. The axle end is faced for length and the right half rough turned .040 in. over the finish size, the axle then being reversed and the other half rough turned. The next operation is to chuck one end of the axle, apply a roller bearing steady to the opposite journal and true the axle center accurately to 6 deg. with $1\frac{1}{2}$ in. outer diameter. A $\frac{1}{16}$ -in. by 2-in. counterbore is also machined in the end of the axle as shown in the drawing to avoid any possibility of upsetting or deforming the axle center in the wheel press.

The steady rest is removed and the axle again put between centers, ready for finish turning. Referring to the car axle drawing, the $7\frac{3}{4}$ -in. wheel seat is turned

first, then the dust guard seat, journal, and finally the taper section at the axle center, using the profile attachment at the back of the lathe. The axle is then reversed in the lathe, using due care to protect the journal against scarring by the lathe dog, and the operations repeated for the other end. This axle was formerly specified to be ground all over which took considerable extra time and was a difficult job, especially with the equipment available at the Rock Island shops for grinding the center tapers. With the smooth, accurate and high-gloss finish provided with tungsten-carbide tools at high surface speeds, grinding is no longer necessary or required, except for dust-guard seats and roller-bearing seats which are ground to permit pressing the races off and on when necessary without losing the fits. Sharp corners are broken and all fillets are ground, thus assuring freedom from tool marks and scratches.

If possible, even greater care is exercised in machining Rocket Diesel locomotive axles, like the lower axle in the drawing. This carbon-steel axle, normalized and tempered, is rough turned about $\frac{1}{8}$ in. above the finish size and then finished with an allowance of .010 in. for grinding all over, except for the end shoulders which are turned and a relief groove which is rolled. Grinding is necessary not only because of the application of roller bearings but for electric-motor-support bearings on the straight section between the wheels on the power axles.

The various parts of this axle are finished in the following order: Gear seat, wheel seat, dust guard, journal seat, end shoulder of axle, motor support bearing on the center of the axle. A relief groove, provided between the gear and wheel seats, has a $\frac{5}{16}$ -in. radius by 1-in. wide by $\frac{1}{4}$ in. deep and is polished with fine emery cloth and rolled. The oil-seal groove or fillet on the end of the dust guard is then machined and polished. All other fillets are turned and ground. The axle is then reversed in the engine lathe and a similar procedure followed for the other end. Approximately 8 hr. is required to machine this axle in the engine lathe and 4 hr. for grinding.

Referring to one of the other illustrations, axles shown at the left are six-roller-bearing tender axles. Those in the middle include two road switcher axles painted to protect against rusting. The axles at the right are for a 5,400-hp. Diesel freight locomotive. Another illustration shows a miscellaneous group of wheels and axles being reconditioned at the 47th Street shop of the road.



Hammond grinder with diamond wheels used in grinding standard cutting tool rakes and clearances, also chip breaker grooves

IN THE BACK SHOP AND ENGINEHOUSE

Tire-Turning Mandrel

When necessary to turn unmounted driving-wheel tires either singly or in pairs, some railroads keep dummy wheel centers on which the tires can be mounted and placed in the driving-wheel lathe for refinishing the flange and tread contours and turning to size. The special mandrel illustrated is used for this purpose at the Oelwein, Iowa, shops of the Chicago Great Western.

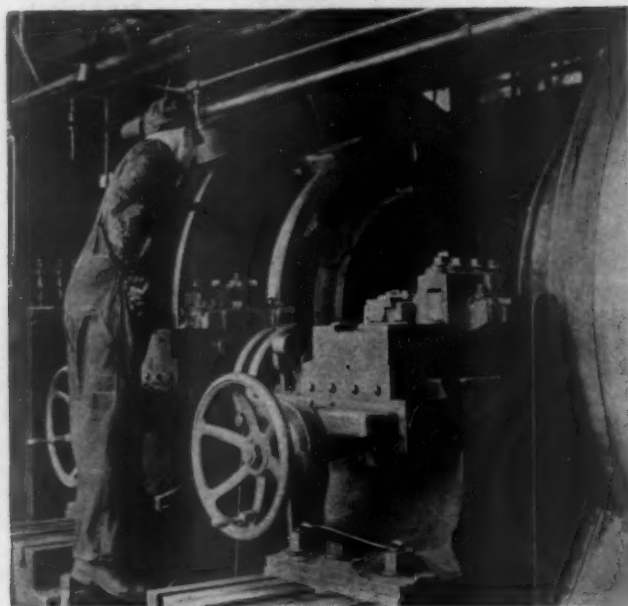
The mandrel consists simply of two cast-iron wheel-center blocks, mounted on an axis and equipped with six large adjusting screws (for each block) and nuts which can be used to adapt the mandrel easily and quickly for tires ranging from 48 in. to 56 in. inside diameter, or 66

in. using dummy spacing rings. A lip on the head of each adjusting screw holds the inside face of the tire square with the axis center line and the adjusting screws are set to make the inner tire diameter accurately concentric with the axle by means of a center gage. Also illustrated is a pair of tires being turned on the mandrel in a wheel lathe.

Generally speaking, there is only one way to make absolutely sure of accurately round and concentric driving-wheel tread contours and that is to turn the tires after they are applied to the wheel centers on which they will operate, which is standard practice whenever tires are turned for classified or other heavy repairs. With due care in using the mandrel, however, reasonably accurate results are secured and the practice is more than justified for at least two reasons: tire metal is conserved, because the use of this mandrel permits replacing tires with sharp flanges, for example, and thus avoids turning an excessive amount of serviceable wear metal off the other tires. Moreover, the job of switching tires can be performed at outlying terminals without sending locomotives to the back shop or an enginehouse equipped with a wheel lathe. Unnecessary expense, delay and loss of locomotive service time are thus avoided.



How tires are centered on the mandrel

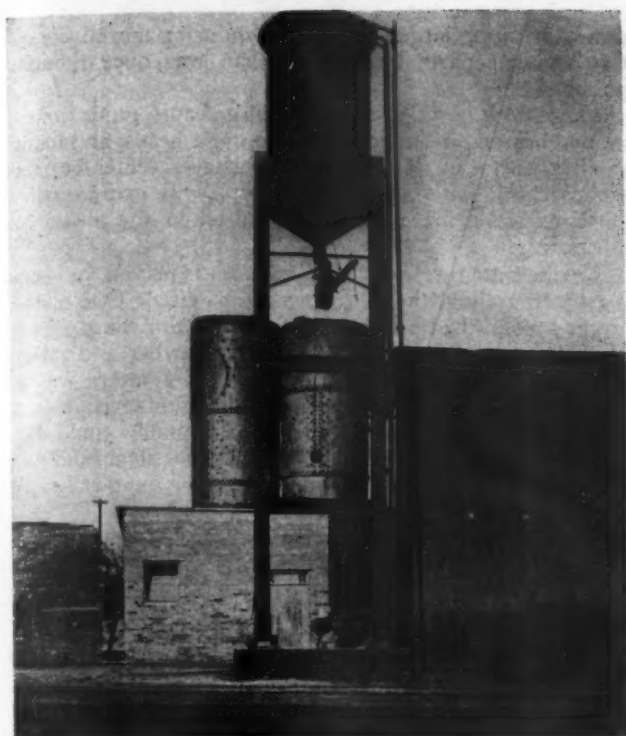


Turning tires on a mandrel at the Oelwein shops of C. G. W.

Sand Drying at Oelwein Enginehouse

One important recent improvement at the Chicago Great Western enginehouse, Oelwein, Iowa, is the provision of new facilities for drying sand and delivering it to locomotives, as shown in the illustrations. By the method formerly employed at this point, sand was unloaded with a derrick hoist and clamshell into an open storage bin 73 ft. long by 7 ft. 10 in. wide, from which sand was shoveled by hand into a hopper leading to two drying units located at ground level and delivering sand to a pressure tank set in the ground underneath. From here, sand was blown to an overhead storage tank and subsequently delivered through suitable pipe and hose connections to the locomotive sand boxes. Not only was a hand-shoveling operation involved in filling the hopper, but, when the level of sand in the storage bin got low, the sand had to be shoveled into a barrow and wheeled up a ramp to the hopper platform, thus involving additional manual labor.

By use of the new equipment, all manual handling of the sand is eliminated. Sand is unloaded from the car with a clam shell directly into two three-course scrap boiler shells mounted vertically on a steel framework directly above the sand dryers which are enclosed in a brick sand house as illustrated. These boiler courses are 85 in. in diameter by 17 ft. 5 in. high, mounted side by side and in fact riveted together at the top courses which are in contact. Sand works from the boilers down through dryers to a 40-in. by 6-ft. pressure tank placed vertically in a concrete pit 6 ft. square by 11 ft. deep directly underneath. From this pressure tank, sand is delivered through a 2½-in. double-strength steel pipe to a 15-ton storage tank, located about 40 ft. above rail level and supported, when first installed, from the coal shed and more recently



Front view of new sand-handling plant at Oelwein enginehouse



The two coal-fired sand-drying stoves in operation

from two 10-in. steel I-beams set firmly in a concrete foundation. Sand passes to the locomotive through a suitable pipe and 4-in. rocker gate valve to a slip-joint pipe extension which delivers sand to either large or small locomotives and permits filling sand domes with dry sand in about 3 min. each.

By the former method, one man was required on each 8-hour shift in winter to feed sand to the hoppers and tend fires in the sand-drying stoves. In summer, only one man was required on each of two eight-hour shifts. By the present method, the only manual labor involved is tending the fire which has to be refueled about three times during an eight-hour shift and the ashes and clinkers removed once in eight hours, this work being done by the coal dock operator.

Sand for the Oelwein enginehouse is received from Waterloo, Iowa, in open-top gondolas and 40 tons of sand are put directly into the scrap boilers, the balance of the load, only, being placed in the storage bin and thus subject to double handling. The two boiler shells are

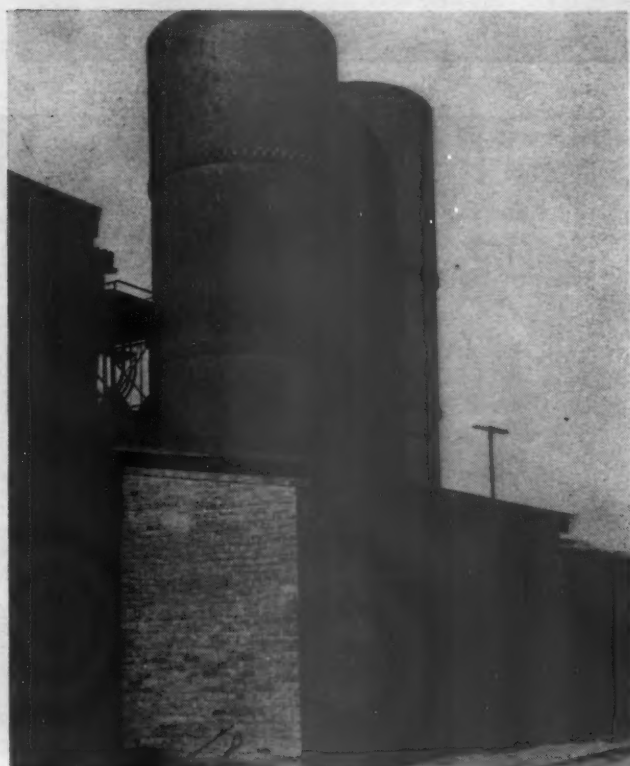
filled to the top and this moist sand given a preliminary heating by the smoke pipes which extend up through it.

When necessary to refill the pressure tank in the concrete pit, air pressure is exhausted and the sand is fed by gravity through a gate valve until the tank is filled, at which time the gate valve is closed and air pressure re-applied to the tank. Opening another valve located at ground level admits air to an injector at the bottom center line of the pressure tank which blows a combination of air and sand up the vertical pipe and over a short cross-over pipe to the sand storage tank overhead. It generally requires about 9 to 12 minutes to fill the storage tank. Tees are installed at all bends to minimize cutting and these tees will usually last about three months. The air pressure utilized is about 105 lb.

The boilers are open at the top and funnel-shaped at the bottom where they deliver sand to the two sand stoves placed side by side in the brick sand house. These funnels are off center so the stoves can be placed near together. The top edges of the stove hoppers are located about 8 in. below the point of delivery of the sand in funnels so they will not overflow. The two stove smoke pipes, made of $\frac{3}{16}$ -in. steel, 9 in. in diameter, extend up through the boilers and 12 in. above the top where deflectors are applied to keep sand out of the pipes. The length of these stove pipes assures excellent draft and gives a preliminary heating of the sand which saves fuel.

Moist sand feeds down around the stove firebox and as it dries falls to a screen of $\frac{1}{8}$ in. mesh wire, then dropping to the hopper with gravity feed to the pressure tank underneath. The screen is set on an angle of about 25 deg. so that fine sand drops through and coarser particles roll to the bottom on a steel shoveling sheet from which they are thrown out with the cinders. The stoves are hand fired with regular coal about three times in eight hours and the ashes removed once each eight-hour shift.

Demonstrated advantages of this plant includes a substantial saving in manual labor; avoidance of double han-



Rear view of the sand storage boilers and sand-drying house

...dling for most of the sand, some economy in fuel and the provision of an adequate supply of fine dry sand where and when needed.

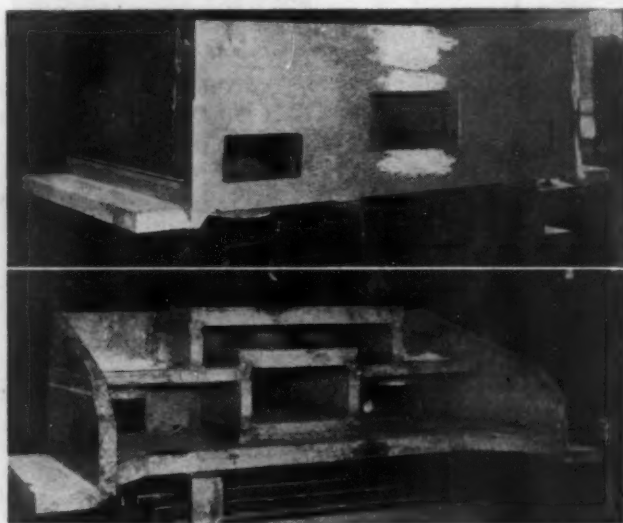
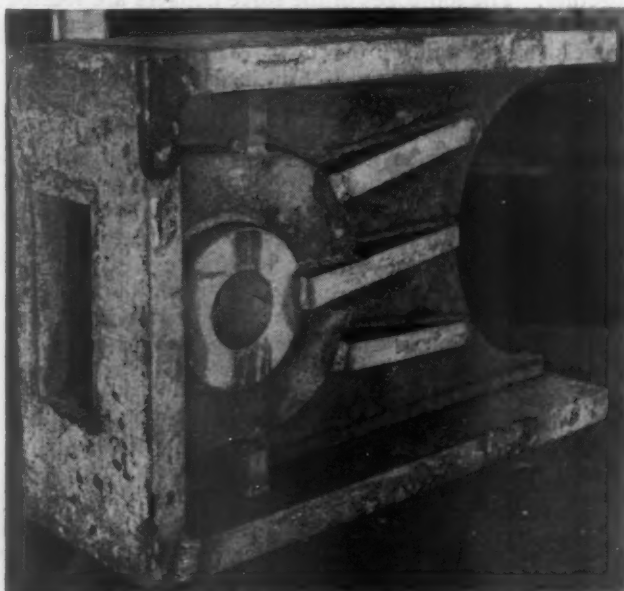
Welded Steel Parts

Steel foundries are working night and day, turning out material for the war effort, and orders for steel castings for locomotives and cars are sometimes subject to lengthy delays in being filled, particularly in the case of western carriers. In order to avoid keeping vital and much-needed locomotives out of service unnecessarily long when steel castings fail, the welding shop of the Southern Pacific, at Sacramento, Calif., has extended its operations and is

now fabricating larger items and producing more locomotive and car parts by welding than was once thought possible.

Large deck parts, drawheads, pilot beams, guide yokes, motion bearers, cylinder and steam-chest heads, and many smaller parts for locomotives, bolsters, center-bearing arches, check plates and drawbar stops, with many smaller parts for cars, are now manufactured in the shops by fabricating.

To illustrate the part that fabrication is playing in keeping trains rolling, the following case is cited: One of the larger tenders had a failure of the front drawhead which fits between the frame and takes the drawbar and safety bars that connect with the locomotive. No pattern was at hand to make this part and it would take seven to ten days to make a pattern. The steel foundry could not promise delivery of the casting under 90 days and the locomotive could not be held out of service for that length



Left and above: Two types of front drawheads for tenders, fabricated by welding



Welding force and typical work done at the Sacramento shops of the S. P.—Transmission bar and guide yoke shown in foreground; driving box cellars and back steam chest heads on skid

of time. The drawing of the part was checked and necessary steel detail parts cut to shape ready for fabrication. The part was welded, annealed, finished, ready for the tender in five days and was on the tender and in service by the end of the sixth day.

Fabricating a locomotive or car part consists of cutting with an oxyacetylene torch on a pantograph machine of the various detail parts from steel plates. These parts are fitted together with suitable jigs and welded in place by the electric process, after which the part is annealed in a furnace. Finishing and drilling is done in the machine shop in the same manner as a steel casting would be finished. The resulting product is then applied to the locomotive.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Tender Deck Height

Q.—The I. C. C. rules state that the difference in height between the deck on the tender and the cab floor or deck on the locomotive shall not exceed 1½ in. Does it make any particular difference which one is above the other?—F. E. M.

A.—The rule does not make any distinction. The general practice is to have the tender deck one inch lower than the engine deck, when the tender is fully loaded. The tender deck height varies approximately two inches between the loaded and light conditions, and, therefore, varies in height from one inch below to one inch above the engine deck level.

Injecting Sand Into Oil-Burning Fireboxes

Q.—Why is it necessary to feed sand into the firebox of an oil-burning locomotive? Is this practice detrimental to the life of the firebox?—E. S. C.

A.—Sand is injected into the firebox of an oil-burning locomotive at frequent intervals for the purpose of cleaning the soot from the tubes and flues. The sand is passed into the firebox through a hole in the firedoor where it is picked up by the draft and drawn through the tubes and flues cleaning them as it passes through. It results in a reduction in the life of the firebox sheets, tubes and flues.

Cinder-Cutting Problem

Q.—We have considerable trouble with cinder cutting of flues at the point where they have been expanded in the rear tube sheet. The expanding of the flues in the rear tube sheet makes a ridge around the flue at this point and cinder cutting results. Could the life of the flues be extended by building up the thickness of the flue at this point by electric welding?—M. I. R.

A.—It is not recommended that flues be built up by welding at this point; the projection of the weld would, in effect, close up the flue area still more and increase the likelihood of cinder cutting. Welding at this point would also have a detrimental effect on the copper ferrules inserted between the flues and the tube sheet if ferrules are used. It would be better practice to apply a heavier

gauge safe end on the flue, making the safe end from 12 to 15 in. long. This would give increased flue thickness at the point of cinder cutting and lengthen the life of the flue.

Forced Cooling Of Locomotive Boilers

Q.—What is meant by forced cooling of a locomotive boiler? What procedure is followed?—A. M. F.

A.—Forced cooling is used when there is not sufficient time to permit a boiler to cool naturally before washing it. At locomotive terminals equipped with blowdown facilities, the blowoff cock on the locomotive, is connected to the blowdown line and the boiler is filled from the injector. The blowdown is regulated to keep a visible indication in the water glass. After the steam pressure is lowered to a point where the injector will not work, the blowoff cock must be closed for a period of 15 min. after which the blowoff cock is again opened until the steam pressure is reduced to the point where it is no longer sufficient to force the water through the blowdown system. When this condition is reached the pipe to the blowoff cock is disconnected and the boiler is drained into the pit. The blowoff cock should be choked so that the boiler is blown of all water and steam in approximately 1½ hours.

Renewal of Front Tube Sheets

Q.—We have several boilers on our Pacific-type locomotives which have front tube sheets from 10 to 12 years old. These tube sheets have developed cracks in the knuckle along the bottom of the boiler. Should the sheets be renewed at this time or would it be satisfactory to repair them?—F. I. K.

A.—The actual age of the front tube sheets is not as important as the condition of the sheets in determining whether or not they should be renewed or repaired. Any portion of the tube sheets still in good condition should be retained. Tube sheet defects are generally found in the tube and flue area and in the knuckle along the sides and bottom of the tube sheet. The tube sheet should be examined carefully for all defects, such as pitting on the water side, cracking in the knuckles, and cracking around the tube and flue holes caused by excessive rolling and working of the tube and flues when the holes have become enlarged. The stayed portion of the tube sheet is generally found to be in good condition as compared to the rest of the sheet. General practice is to renew that portion of the tube sheet which is found to be defective, butt-welding the new and old portions of the sheet.

Cracked Throat Sheets

Q.—Would running a locomotive after the removal of the lagging and jacket from the throat sheet and throat sheet corners, result in cracked throat sheets?—F. E. L.

A.—Cracked throat sheets can be the result of any of the following conditions: Strains due to unequal expansion and contraction; rigidity of construction at the throat sheet; improper flanging of the throat sheet in either heating or forming; over-rapid firing of the locomotive; changes in temperature caused by flow of water; strains set up due to the rigidity of the connection between the front of the firebox and the engine frames; failure to properly maintain the free movement of the sliding blocks between the front of the firebox and the frames; or crystallization of material due to working. While the removal of the lagging and jacket from the throat sheet and throat-sheet corners would expose the sheet, with a resultant cooling effect which could result in strains due to expansion and contraction, it does not necessarily follow that this would be the direct cause for a cracked throat sheet.

ELECTRICAL SECTION



Fig. 9—Pinions are pulled with a hydraulic puller, the crane being used to support the puller head during the operation

Electrical Shop for Diesels

THE first operation in traction-motor overhaul consists of pulling the pinion (Fig. 9) and disassembling the motor. Frames are cleaned in one cleaning bay equipped with an exhaust fan, and armatures in another. The cleaning is done with spray nozzles operated from shop air pressure, using a solution consisting of a half-and-half mixture of carbon tetrachloride and Gulf Standard solvent. Exhaust fans at the back of the booths keep the shop and the booths free of cleaning vapors.

Work schedules and work reports are divided primarily between the work done by the shop crafts, mechanical and electrical. Thus there is a Mechanical Assembly Report, an Armature Report, and a Field Coil and Frame Report, covering all work done on traction motors. There is another report on generators but it is not included with this article. When the work is finished, the electrical shop fills out its own shop record card, referred to previously as Fig. 6, and makes out a Summary of Work Performed, which is sent to the Diesel superintendent.

Part II

Southern installs new facilities at Atlanta, Ga., for overhaul and repairs of all traction motors and generators used on Diesel - electric locomotives

After the armature has been removed from a frame, brush holders are removed and coils are inspected for looseness and defective insulation. Brush rigging is overhauled if necessary. A standard brush is passed through all carbon ways to insure free movement.

SUMMARY OF WORK PERFORMED

| | |
|--|-----------------------|
| Name of equipment..... | Serial No..... |
| Type or style..... | Manufacturer..... |
| Date rec'd in shop..... | From..... |
| Date out of shop..... | Shipped to..... |
| Removed from unit..... | Reason..... |
| Mileage this application..... | Accumulated..... |
| Approximate cost of repairs—Labor..... | Armature..... |
| Disassemble and clean field frame, armature, bearings and bearing parts..... | Material..... |
| Impregnate armature..... | Balance armature..... |
| Armature Serial No..... | Total..... |
| Finish commutator..... | Undercut mica..... |
| Check field frame for loose coils, dip and bake..... | Burr bars..... |
| Overhaul brush holders..... | |
| Are bearings new or old C.E..... | P.E..... |
| Apply high potential test of..... | VAC to armature..... |
| Overhaul external leads, terminals and blocks as necessary..... | VAC to frame..... |
| Apply bearing test run and observe operation — Results..... | |
| Apply Pinion No..... | Advance..... |
| New or old..... | No. of teeth..... |
| Note Below Any Special Work Performed | |
| Note 1..... | |
| Note 2..... | |
| Note 3..... | |
| Note 4..... | |
| Note 5..... | |
| Report No..... | Date..... |
| Foreman motor shop..... | |

As noted previously, field frames with coils in place are spray-cleaned. From the cleaning bay they are transferred to one of the bake ovens where they are maintained at 115 deg. C. for 12 hrs. While still hot, pole-piece bolts are checked for tightness, after which frames with coils in place are spray painted with black air-drying varnish. Facilities will be provided for dipping and baking fields and frames as a unit.

Motor leads are cleaned and reinsulated. Wood cable cleats are removed, cleaned, painted and reapplied.

When it becomes necessary to remove field coils or pole pieces, the work is facilitated by a frame positioner which permits rotating the frame so that the coil to be removed is always at the bottom.

FIELD COIL AND FRAME REPORT

| | |
|---|-----------------------------|
| Motor Serial No..... | Job. No..... |
| Type or Model No..... | Manufacturer..... |
| Megger reading of field frame before cleaning..... | |
| Is there any indication of thrown solder in frame..... | |
| Examine frame for loose or chafed coils..... | |
| Clean frame and preheat..... | hours at..... deg. C. |
| Chart No..... | |
| Tighten all pole bolts while frame is hot (before dipping)..... | |
| Dip in varnish and bake..... | hours at..... deg. C. |
| Chart No..... | |
| Are all brush holder support brackets tight (Test with hammer)..... | |
| Does brush holder clamp bolts turn freely to extent of threads..... | |
| Condition of internal cables and connections..... | |
| Paint frame and coils with two coats of air-drying varnish..... | |
| Remove and clean external cable cleats..... | |
| Renewed..... | |
| Condition of rubber frame grommets..... | |
| Renewed..... | |
| Condition of cable hose..... | |
| Renewed..... | |
| Terminals..... | |
| Are cap screws to pole piece on axle side welded..... | |
| Reseal rubber frame grommets and top pole bolts..... | |
| Clean connections and install brush holders in frame..... | |
| Megger reading before applying high potential test..... | |
| Apply high potential test of..... | volts a.c. for..... seconds |

Armature Reconditioning

After cleaning, armatures are preheated at 115 deg. C. for 12 hours. While still hot they are placed in the vacuum impregnator where they are impregnated with Sterling R-583-Y varnish. The varnish is given weekly tests to assure its having a specific gravity of 0.875 plus or minus 0.005 at 70 deg. F. It must also pass a Ford cup test for viscosity of 30 to 50 seconds at 70 deg. F. Thinner is added as needed to maintain proper values. After impregnation, armatures are baked for 20 hours at 150 deg. C.

When removed from the baking oven, armatures must be cooled before the next operations can be performed. This would normally require from six to eight hours. A cooling rack is used to shorten this time. It consists of a rectangular metal box about one foot in depth made of welded steel plates, as shown in Fig. 10. There are six round holes in the top, a little smaller in diameter than a motor armature. A motor-driven fan forces air into the box and through the ventilating ducts of armatures which are placed on end over the holes. If less than six armatures are to be cooled at once, the unused holes are closed with plate metal covers secured in place with cap screws. This procedure reduces the cooling time to about one-fourth that required without the forced ventilation.

After cooling, the armatures are placed in the armature machine for undercutting and grinding of commutators and for a bar-to-bar test. From the armature machine they are moved to the balancing machine which is centrally located in the shop. There is a storage stand (Fig. 11) adjacent to the balancing machine which is used to hold armatures between operations. It consists



Fig. 10—An armature cooling rack with two armatures in place

of a large flat steel plate elevated about one foot from the floor in which there are a number of holes slightly larger than the diameter of an armature shaft. Armatures are placed commutator-end up on the stand with the shaft extending down through the hole in the plate, an arrangement which takes much less space than stands for supporting them horizontally.

A preliminary balance is obtained on the balancing machine by using wads of modeling clay for balancing weights. After the proper location and amount of weight

MECHANICAL ASSEMBLY REPORT

Motor Serial No. Job No.
 Type or Model No. Manufacturer
 Assemble Armature No. Pinion No.
 Job completed (Date) Shipped to
 Inspection of Armature Bearings and Housings
 Clean both bearings with 50-50 solution of gasoline and carbon tetrachloride
 Inspect bearing rollers and races for wear, pits, scratches and heat
 Condition of brass roller cage and rivets C.E.
 P.E.
 Internal bearing clearance (Not mounted) C.E.
 P.E.
 Diameter of outer bearing race C.E.
 P.E.
 Diameter of inner bearing race C.E. (Outside)
 (Inside)
 Diameter of inner bearing race P.E. (Outside)
 (Inside)
 Condition of C.E. thrust collar
 Renewed Thickness
 Condition of oil slingers C.E. P.E.
 Renewed C.E. P.E.
 Are bearings to be used new or same C.E.
 P.E.
 Clean bearing housings and caps, inspect for defect, polish machine fits and paint
 Important Note—Polish machine fits with wire brush, do not use abrasive.
 Diameter of bearing housing bore C.E. P.E.
 Signed Date

Armature Bearing Assembly

Clean armature shaft, grease sealing grooves and remove all burrs
 Diameter of shaft (At inner bearing race fit):
 C.E. P.E.
 Diameter of inner bearing race (After assembly):
 C.E. P.E.
 Internal bearing clearance (After assembly):
 C.E. P.E.
 Clean bearing housing fit on frame and remove burrs:
 C.E. P.E.
 Dial indicate bearings C.E. Inch P.E. Inch
 Apply thrust collar and lock in position Inch
 Amount of end play Inch
 Important—Move armature to limit of lateral several times before checking end play.
 Amount of grease applied to bearings:
 C.E. Ounces P.E. Ounces
 Prime grease tubes C.E. and P.E.
 Were grease tubes renewed C.E. P.E.
 Signed Date

Final Assembly and Tests

Bearing test run R.P.M. Hours
 Reverse R.P.M. Hours
 Temperature C.E. (Start) F. (Max.) F.
 (Final) F. (Not to exceed 140)
 Temperature P.E. (Start) F. (Max.) F.
 (Final) F. (Not to exceed 120)
 Important Note—Left shaft cool to room temperature before applying pinion.
 Date of pinion Number of teeth
 Does pinion Magnaflex O.K.
 Is pinion new, same, or from another motor Wear
 Advance reading of pinion (Hot) Heated to
 Deg. F. Time required
 Advance reading of pinion (Cold) (1)
 (2) (3) Room temp.
 Final advance of pinion Was pinion lapped to shaft
 Are all baffle plates and screens in place
 Tap out air duct bolt holes
 Wear or gear case supports:
 (Motor frame) Inches (Axle cap) Inches
 Are all nuts for suspension cap bolts welded in place
 Check wear on nose suspension wear places
 Inches renewed
 Clean and apply axle caps (Serial No.)
 With Shims
 Have axle caps been checked for cracks
 Tighten axle cap drain plugs
 Check waste holding plates and springs and apply new felts on all covers
 Cover all screens and openings with paper, paint motor and apply lubrication tags
 Signed Date
 Serial No. Report No.

has been determined, permanent weights are applied. On the back-end of the armature these consist of split weights attached with set screws and on the commutator end they are solid pieces tack welded in place. In making the commutator-end weight, due allowance is made for the weight of the added weld metal. High-speed armatures are balanced to within $\frac{1}{4}$ oz. at the periphery. After balancing, the armature is given a light coat of

air-drying varnish. The Vee ring and commutator risers are painted with DuPont, Flintflex Red. The armature is then Meggered and given a high potential test; the bearings applied and the armature assembled in the frame. When the motor is disassembled, bearings and bearing parts are removed and thoroughly cleaned with a mixture of gasoline and carbon tetrachloride and immediately dipped in light motor oil. Housings and caps are cleaned with an Oakite solution. The correct amount of grease is added after the bearing is assembled.

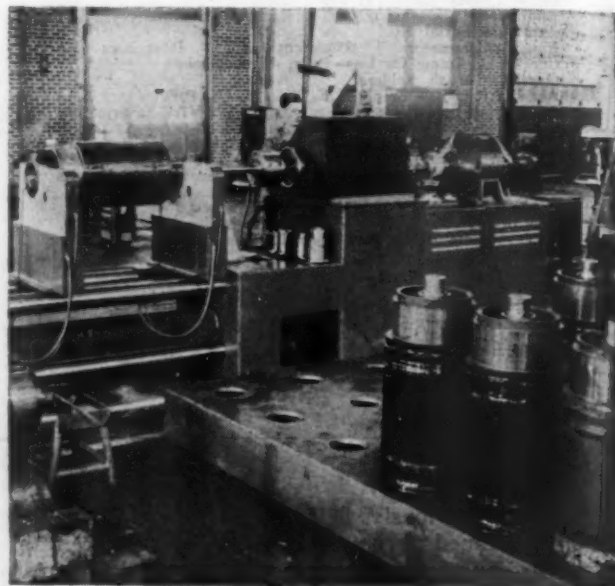


Fig. 11—The balancing machine—The armature storage rack for storing armatures vertically is shown in the foreground

A run-in test at 1,500- to 1,800-r.p.m. is made before the motor is shipped or installed. Bearing temperatures are checked, brushes run-in and bearings checked for proper operation. A motor-generator set consisting of a 125-volt, 400-amp. separately excited generator is used

(Continued on page 270)



Fig. 12—Frame for applying and puller for removing Vee pulleys on auxiliary-generators

Electrification 50 Years Old

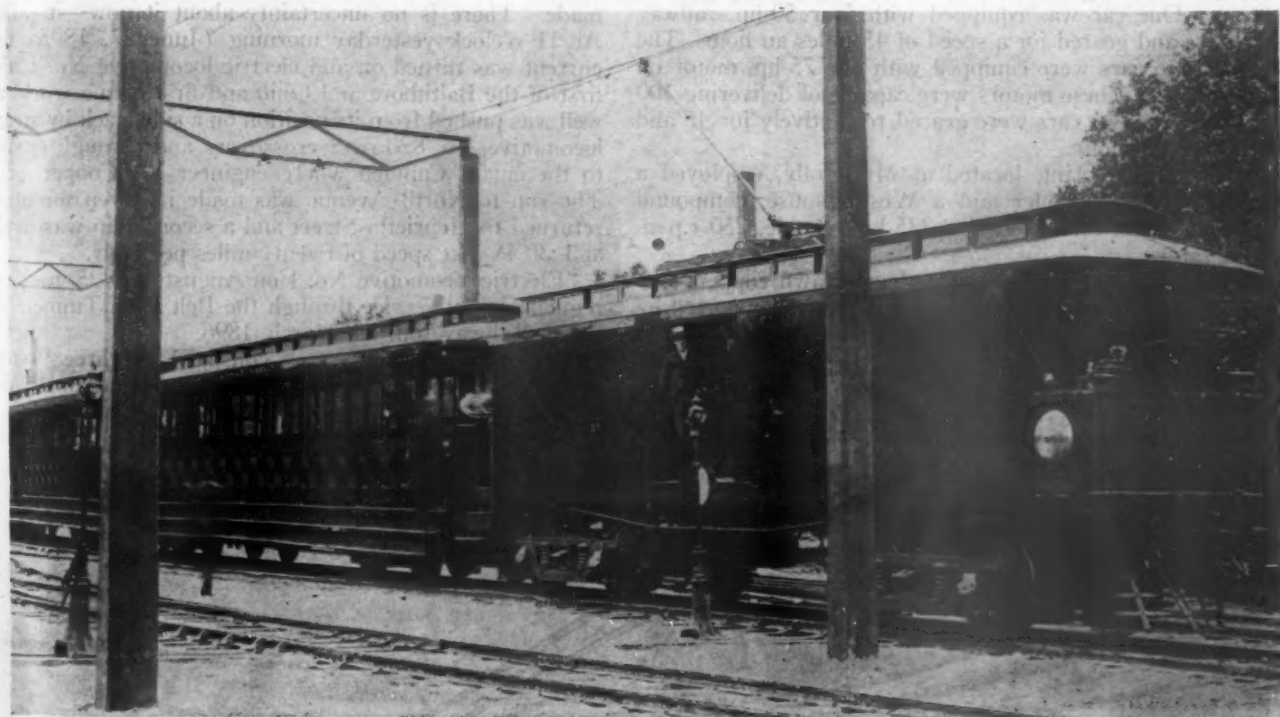
ELECTRIC traction celebrates a half century of operation this year. Fifty years ago, in 1895, three railroads, the New York, New Haven & Hartford, the Baltimore & Ohio and the Pennsylvania, replaced steam with electric power, credit for "famous firsts" being claimed for two of them on different counts.

The Boston Post in an article appearing June 28, 1895, under the title "Fate of Steam" states, "The use of electricity as a motive power in place of steam will begin for regular service on the Nantasket branch of the New York, New Haven & Hartford railroad today. The event is one in which the officials and employees of that great corporation as well as the General Electric Company, which has had the fitting of the line to be operated with the necessary electric equipment, express the deepest interest, it being regarded as a pioneer experiment to test the value of a new power as compared with the one relied

Three railroads replaced steam locomotives with electric motive power in 1895

330,030 c. m. wire of figure-eight section supported by wood poles and double brackets, the distance between the centers of the two tracks being 15 ft. The poles which were of sawed, hard pine were the only insulation between the wires and the ground. The overhead wire was later replaced by a third rail.

The original Nantasket line was later extended and from this beginning, a number of applications were made



Motor baggage car and trailers as used on the Nantasket Branch of the New York, New Haven & Hartford in 1895

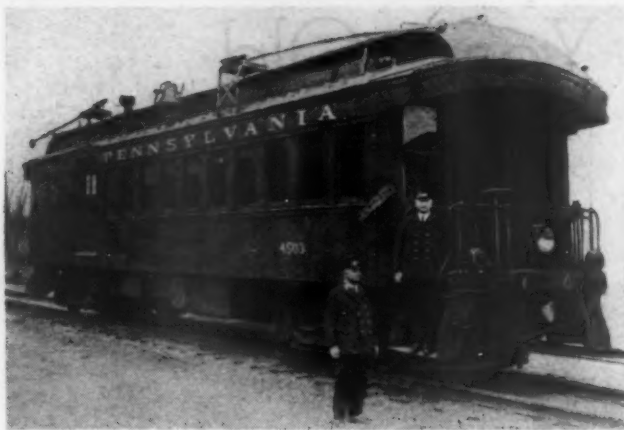
upon so long. Railroad men and electricians throughout the world are also giving it close attention, claiming the result will go beyond anything yet done to determine the practical worth of electricity as a substitute for steam on broad-gauge roads."

The rolling stock on the Nantasket branch consisted of ten motor cars, six open and four closed and a number of trailers. Each motor car weighed 60,000 lb. and was designed to handle three or four trailers. Power was supplied from a power plant installed for this purpose which was equipped with two tandem compound Greene engines operating at 110 r.p.m. and rated at 1,420 hp. each. The generators were rated 500 kw. each and the station voltage was nominally 700 volts.

The original contact system consisted of an overhead

leading up to the present 11,000-volt a.c. electrification between New York and New Haven, Conn., employing locomotives capable of exerting up to 9,000 hp. Historical facts concerning the early developments are ably presented in a paper by Sidney Withington, electrical engineer, the New York, New Haven & Hartford, appearing in Bulletin No. 26, published October, 1931, by the Railway and Locomotive Historical Society, Chicago, Illinois and Boston, Mass.

Also in 1895, on July 22, the Pennsylvania electrified its Mt. Holly Branch consisting of eight miles of double track with overhead contact system from Mt. Holly, N. J. to East Burlington, on the main line from New York to Camden, N. J.



One of the first electric motor cars used on the Mt. Holly Branch of the Pennsylvania in 1895

The electric motive power consisted of three combination baggage-and-passenger motor cars each capable of drawing a standard P. R. R. coach at a speed of from 45 to 60 miles an hour. The motors were built and installed by the Westinghouse Electric & Manufacturing Company. One car was equipped with four 50-hp. railway motors and geared for a speed of 45 miles an hour. The other two cars were equipped with one 75-hp. motor on each truck. These motors were capable of delivering 100 hp. and the two cars were geared respectively for 45 and 60 miles an hour.

The power plant, located at Mt. Holly, employed a 300-hp. Climax boiler and a Westinghouse, compound engine, direct connected to a 225 kw., 8-pole, 250 r.p.m. generator.

The trolley wire was No. 00 hard-drawn copper, suspended 22 ft. above the track by span wires supported by chestnut poles on each side of the track. There were two 500,000 c. m. feeders, one running the full length of the line and the other about six miles. Rail joints were

bonded and two supplementary wires alongside each rail were used for the return circuit.

There are now 671 route miles and 2,231 miles of track in the Pennsylvania's 11,000-volt a. c. Philadelphia, Pa.-Harrisburg-Washington, D. C.-New York electrified lines and the rolling stock consists of some 300 electric locomotives, 385 multiple-unit cars and 47 trailers.

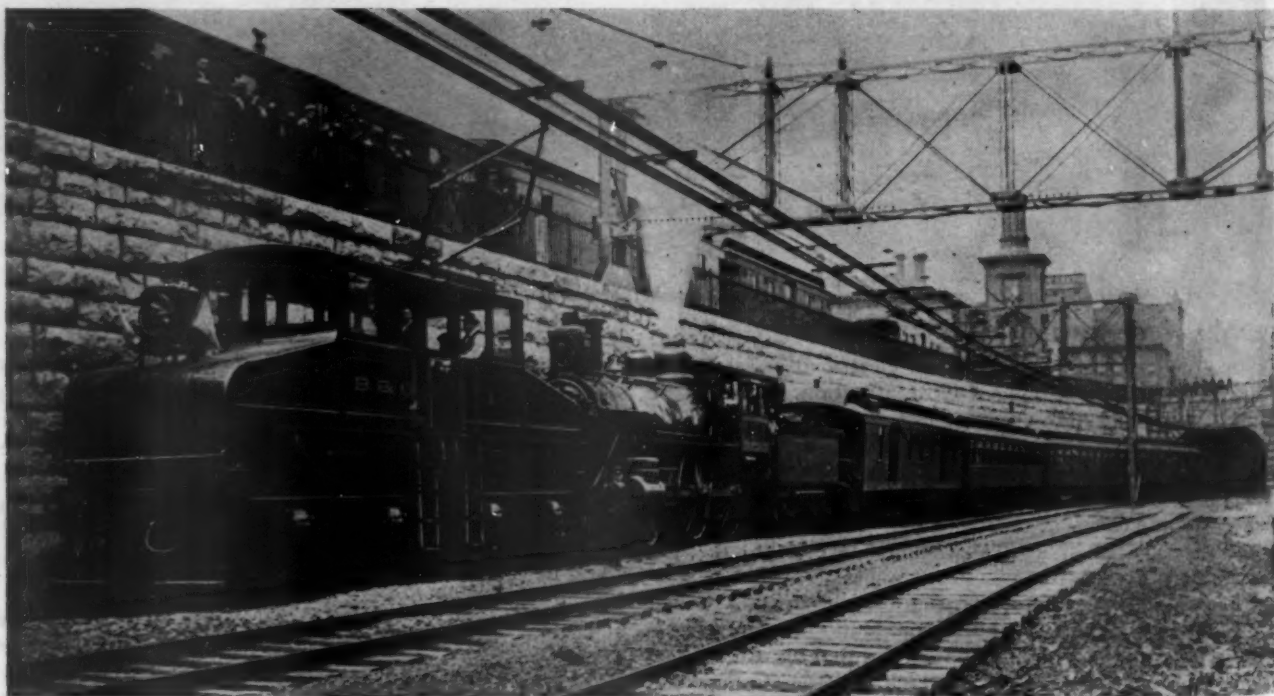
The Baltimore & Ohio which also electrified a steam railroad in 1895 bears the distinction of being the first railroad to use electric locomotives in trunk line service. That portion of the Baltimore & Ohio which was electrified and which is still in operation lies within the city limits of Baltimore and is a part of the so-called Belt-Line, extending from Camden Station on the west to Waverly interlocking tower on the east, a distance of 3.75 miles.

There are eight tunnels in this zone, the longest being 7,300 ft. The tunnel contains two tracks and a part of the line outside of the tunnels is four-track. The average grade is 0.9 per cent and the ruling grade is 1.5 per cent. The electric locomotives are used to haul trains including the steam locomotive eastbound up the grade and return light down grade, the steam locomotives handling the trains in this direction.

The Baltimore Sun of Friday, June 28, 1895, states: "Yesterday, an informal test of this 100-ton machine was made. There is no uncertainty about it now—it pulls. At 11 o'clock yesterday morning (June 27, 1895) the current was turned on and electric locomotive No. 1, the first of the Baltimore and Ohio and first of the world as well was pushed from its position on a side track by steam locomotive No. 820 over crossovers and through curves to the cut at Camden where engineer W. Cooper. . . . The run to North Avenue was made in seven minutes; returned to Henrietta Street and a second trip was made at 1:30 P. M.; speed of twenty miles per hour."

"Electric locomotive No. 1 on August 4, 1895, took up regular freight service through the Belt Line Tunnel."—Street Railway Journal, March, 1896.

The original rolling stock consisted of three 96-ton gearless locomotives. The armatures were mounted di-



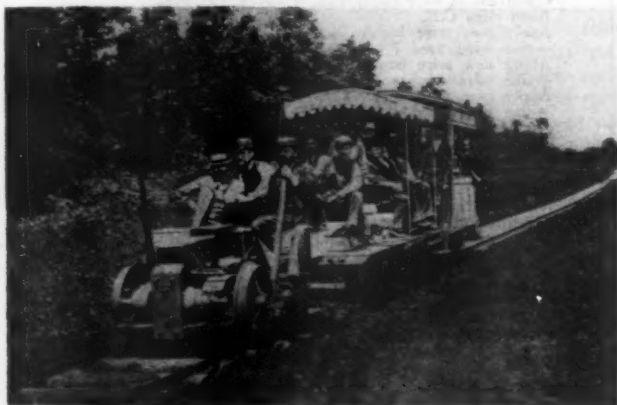
Electric locomotive No. 1, built in 1895 pulling a train with its steam locomotive out of the Baltimore & Ohio tunnel in Baltimore

rectly on the main driving axle, the connection to the driving wheels being made through a spider and rubber driving cushions.

Power was supplied directly from a power plant built for that purpose and equipped with five, 500-kw., 700-volt, d. c generators direct-connected to tandem compound, non-condensing Corliss engines.

The original contact system was overhead and employed two Z-bars so arranged as to form a box-like structure with a slot at the bottom. The collector shoe which slid in this slot was attached to the locomotive by a pantograph. Outside the tunnels the Z-bars were supported from towers by catenary construction and in the tunnels by direct hangers. In 1908 the overhead conductors were replaced by a third-rail system. The installation, with newer locomotives, is still in operation.

Steam railroad electrification was antedated several years by electric street railways. The first of these was the Sprague installation in Richmond, Va., early in 1888. Street railways also initiated the use of electric locomotives, the first employed in regular service in the United States being the freight unit installed in May, 1888 on the Ansonia Derby and Birmingham Electric Line. The motive power for this line consisted of three passenger cars



Edison's electric locomotive and experimental track at Menlo Park in 1880

and one locomotive built by the Van Depole Electric Manufacturing Company.

It was 65 years ago, in 1880, that Thomas A. Edison laid a mile of track of 3½ ft. gauge at Menlo Park, N. J., over which he ran cars drawn by an electric locomotive, consisting of a four-wheel iron track on which was mounted a 75-amp., 110-volt motor. The two running rails delivered the current to the locomotive, each wheel having a metal rim and a wood center. A three-legged spider connected each wheel rim to a brass knob from which current was collected by brushes for connections to the motor. A maximum speed of 42 miles an hour was attained.

Following this initial development, a number of electric locomotives were tried. These included the Daft engine "Ampere" on a 12-mile section of the Saratoga, Mt. McGregor and Lake George in 1883, the Daft, "Benjamin Franklin" operating on the New York Ninth Avenue elevated between 14th and 50th Streets in 1885, the Field locomotive tried on the Second Avenue Elevated in New York in 1888, the gearless locomotive built by the Thompson-Houston Company, exhibited at the Chicago World's Fair in 1893 and used in the streets of New Haven, Conn., in 1896 by the Manufacturers Railroad.

Railroad Radio Channels

The Federal Communications Commission on May 17, announced its final frequency allocations to the non-governmental radio services in the portion of the spectrum between 25 and 30,000 megacycles with the exception of the 44 to 108 megacycle region of the spectrum, which is left unassigned at this time pending the outcome of measurements and tests of FM transmission during the coming summer. Railroads have been assigned 60 clear channels in the 152-162 mc. range. A summary of allocations made in the 25-30,000 mc. range is shown below.

Channel Assignments between 25 Mc. and 162 Mc. to Non-Governmental Services

| Service | January 15, 1945 Proposed report | | | Draft final report | | |
|--|-------------------------------------|------------------|-------|--------------------|------------------|-------|
| | Non-sharing | Sharing* | Total | Non-sharing | Sharing | Total |
| Police | 122 | 0 | 122 | 132 | 0 | 132 |
| Fire | 35 | 0 | 35 | 39 | 0 | 39 |
| Provisional | 0 | 26 ¹ | 26 | 0 | 36 ² | 36 |
| Power, petroleum, etc. | 21 | 0 | 21 | 31 | 0 | 31 |
| General highway mobile | 24 | 0 | 24 | 40 | 0 | 40 |
| Marine mobile | 0 | 16 ³ | 16 | 8 | 15 ⁴ | 23 |
| Special emergency | 10 | 0 | 10 | 6 | 10 ⁵ | 16 |
| Urban transit | 0 | 10 ⁶ | 10 | 0 | 17 ⁷ | 17 |
| Urban mobile | 0 | 7 ⁸ | 7 | 24 | 0 | 24 |
| Forestry and Conservation | 23 | 37 ⁹ | 60 | 25 | 34 ⁹ | 59 |
| Aeronautical (flying school and flight test) | 0 | 4 ¹⁰ | 4 | 7 | 0 | 7 |
| Railroads | 33 | 0 | 33 | 60 | 0 | 60 |
| Geophysical | 0 | 35 ¹¹ | 35 | 0 | 49 ¹² | 49 |
| Relay Press | 0 | 26 ¹³ | 26 | 0 | 10 ¹⁴ | 10 |
| Relay broadcast | 0 | 26 ¹⁵ | 26 | 0 | 36 ¹⁶ | 36 |
| Motion Picture | 0 | 26 ¹⁷ | 26 | 0 | 18 ¹⁸ | 18 |
| General experimental | 30 | 4 ¹⁹ | 34 | 0 | 26 ²⁰ | 26 |
| Rural subscriber telephone | 0 | 0 | 0 | 0 | 24 ²¹ | 24 |
| Total | 298 | 217 | 515 | 372 | 275 | 647 |

* The television channels subject to sharing are not shown in this table.

¹ Shared with motion picture, relay press, relay broadcast and geophysical.

² 21 shared with general experimental, 10 shared with special emergency, and 5 shared with urban transit and general experimental.

³ 9 shared with geophysical, 7 shared with forestry, conservation and urban mobile.

⁴ 9 shared with geophysical, 6 shared with forestry and conservation.

⁵ Shared with provisional.

⁶ Shared with forestry and conservation.

⁷ 12 shared with forestry and conservation, and 5 shared with provisional and experimental.

⁸ Shared with forestry and conservation and marine mobile.

⁹ 10 shared with urban transit, 20 shared on secondary basis with fire, 7 shared with marine mobile and urban mobile.

¹⁰ 6 shared with maritime mobile, 12 shared with urban transit, 4 shared with relay press and geophysical, and 12 shared with relay broadcast, motion picture and geophysical.

¹¹ Shared with general experimental on temporary basis.

¹² 26 shared with provisional, motion picture, relay press and relay broadcast, 9 shared with maritime mobile.

¹³ 24 shared with relay broadcast; 9 shared with maritime mobile; 4 shared with relay press, forestry and conservation; 12 shared with relay broadcast, motion picture, forestry and conservation.

¹⁴ Shared with provisional, motion picture, relay broadcast and geophysical.

¹⁵ 6 shared with motion picture, 4 shared with forestry, conservation and geophysical.

¹⁶ Shared with provisional, motion picture, relay press and geophysical.

¹⁷ 24 shared with geophysical, 12 shared with motion picture, geophysical, forestry and conservation.

¹⁸ Shared with provisional, relay press, relay broadcast and geophysical.

¹⁹ 6 shared with relay press, 12 shared with relay broadcast, geophysical, forestry and conservation.

²⁰ 4 to be used temporarily by flying schools.

²¹ 21 shared with provisional and 5 shared with urban transit and provisional.

²² Shared with urban mobile and short distance toll telephone circuits.

The allocations in the 152-162 mc. section of the spectrum are made on the basis of an average channel width of 60 kc. as follows:

| Class of station | No. of channels |
|--|-----------------|
| Police | 36 |
| Fire | 12 |
| Provisional and experimental | 2 |
| Relay press (forestry-conservation, geophysical) | 4 |
| Power, petroleum, etc.* | 6 |
| Maritime mobile | 8 |
| Urban mobile** (rural subscriber telephone, short distance toll telephone) | 24 |
| Relay broadcast (motion picture, geophysical, forestry-conservation) | 12 |
| Provisional and experimental | 2 |
| Railroads | 60 |

* Other classes of stations rendering similar radio services.

** May provide radio communication service to all types of mobile units such as marine, land vehicles, aircraft, etc. Pending final determination of the best method of operation of this service these channels will be assigned on an experimental basis—12 for development on a common carrier basis, 4 for trucks and 4 for buses, except in those cases where it is shown that a different distribution is more desirable.

Services now operating between 156 and 162 mc. may continue temporarily on a non-interfering basis in the 152 to 162 mc. band.

In addition, provision may be made in the 44-108 and 186-216 mc. portions of the spectrum for the operation of non-governmental fixed and mobile services (such as, police control and relay circuits, point-to-point, marine control circuits, forestry fixed circuits, rural telephone, broadcast studio to transmitter links, railroad, terminal and yard operations) upon proper showing of need and that these channels may be shared on a mutually non-interfering basis.

Electric Shop for Diesels

(Continued from page 266)

for making initial bearing tests, for run-in tests and for charging batteries. Its capacity is sufficient for operating four traction motors at one time.

If the overhauled motor is to be shipped, all openings are sealed with paper held in place with tape.

Among the numerous devices developed in the shop for facilitating the work being done are two which deserve special mention. Two of these, shown in Fig. 12, are used for applying and removing multiple Vee pulleys used on auxiliary generators. The welded framework shown serves for applying the pulley. It is long enough to include the machine, a pulley and the hydraulic jack used to press the pulley on the shaft. The end plates are stiffened at the center by triangular welded brackets

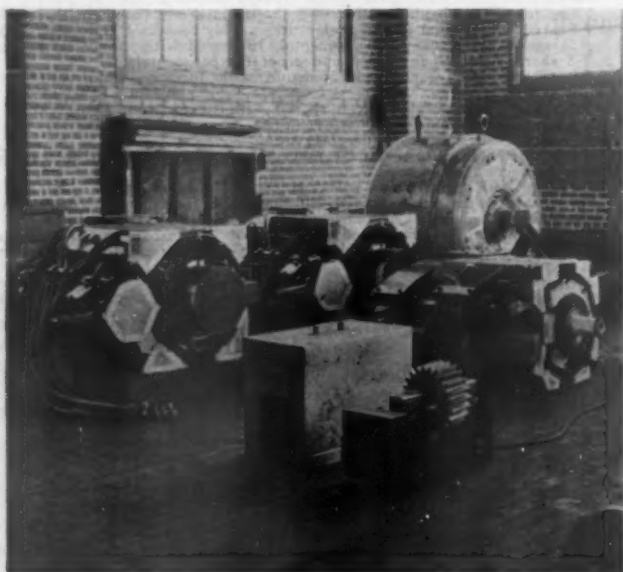


Fig. 13—Motors with all openings covered with paper and tape ready for shipment to outlying points—In the foreground is shown an induction-type pinion heater with a cover for reducing the time of heating

and the upper edges of the plates are connected by threaded rods. It is necessary to remove one of these rods to place the generator in the frame, but this is preferable to making the frame larger, since it would then have to be much heavier to withstand the required pressures.

Multiple Vee pulleys like those shown can be removed with a puller which acts between the inside of the pulley and the end of the shaft, but such a puller often breaks the inside pulley flange. This difficulty is overcome by means of the device shown on the floor at the right. It consists of a split two-part form having internal grooves which exactly fit the grooves of the pulley. The two parts of the form are tightened onto the pulley by two

bolts and the six threaded rods hold a pressure plate at the end opposite the grooved form. A hydraulic jack placed between the pressure plate and the end of the shaft is then used to remove the pulley. This is accomplished easily with no damage to the pulley.

In the foreground of Fig. 13, is shown an induction type pinion heater for applying pinions to traction motor shafts. The unique feature of this heater is the metal cover shown behind the heater. This is placed over the heater when a pinion is being heated and serves effectively to conserve heat, thus reducing the amount of

ARMATURE REPORT

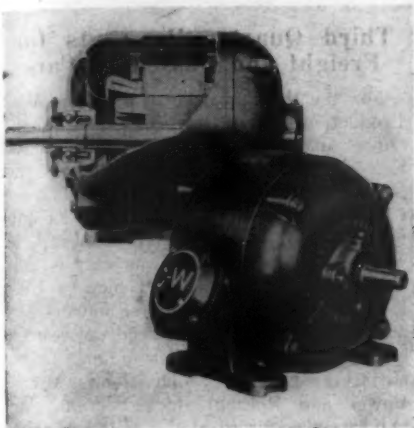
| | | |
|--|---------------------------|--------------------|
| Serial No. | Type | Manufacturer |
| Commutator Serial No. | Date of commutator | |
| Rec'd in shop on Job. No. | Motor No. | Date |
| Out of shop on Job No. | Motor No. | Date |
| Mileage this application | Accumulated mileage | |
| Note below any unusual conditions such as possible overload or overheating, solder thrown out, coil leads loose in riser, commutator bars burnt shaft B.O. | | |
| Is armature new, rewound at Atlanta Motor Shop or service | | |
| Megger reading of armature at disassembly (before cleaning) | | |
| Megger reading of wire bands at disassembly (before cleaning) | | |
| Does armature shaft Magna-flux O.K. P.E. C.E. | | |
| Shaft renewed | | |
| Spec. stamping | | |
| Condition of wire bands C.E. P.E. | | |
| Band clips C.E. P.E. | | |
| Apply new wire bands P.E. lower at | | |
| —size wire used | | |
| Apply new wire bands P.E. upper at | | |
| —size wire used | | |
| Apply new wire bands C.E. lower at | | |
| —size wire used | | |
| Apply new wire bands C.E. upper at | | |
| —size wire used | | |
| Are bands properly soldered and clips in place C.E. P.E. | | |
| Was wire band insulation renewed | | |
| Condition of P.E. coil supports | | |
| Are slot wedges tight | | |
| Condition of string band | | |
| Clean armature and preheat | | |
| Chart No. Hours at | | |
| Impregnate armature and bake | | |
| Chart No. Hours at | | |
| Clean riser, "V" ring and string band and paint red | | |
| Clean P.E. coil support and spray armature with air drying varnish | | |
| Tighten commutator bolts at | | |
| Were bolts renewed | | |
| Are commutator bolts locked or welded in place | | |
| Which method | | |
| Dial indicate commutator (before machining) Taper | | |
| Out of round | | |
| Machine commutator (hone, grind or turn) | | |
| Bevel end of bars | | |
| Diameter of commutator (after machining) | | |
| Dial indicate shaft | | |
| Note below any special machine work done on armature or shaft | | |
| Dial indicate commutator (after machining) Taper | | |
| Out of round | | |
| Undercut mica | | |
| Initial unbalance C.E. Oz. at | | |
| P.E. Oz. at | | |
| Correction made C.E. Oz. at | | |
| P.E. Oz. at | | |
| Final unbalance C.E. Oz. at | | |
| P.E. Oz. at | | |
| Bar to bar test in microns—Minimum | | |
| Maximum | | |
| Average | | |
| Megger reading before high potential test—armature | | |
| Bands | | |
| Apply high potential test of | | |
| for | | |
| Apply high potential test of | | |
| for | | |
| Give armature final inspection, apply identification tag | | |
| Note 1. | | |
| Note 2. | | |
| Note 3. | | |
| Note 4. | | |
| Report No. Signed | | |
| Inspector | | |
| Serial No. Date | | |

power required and shortening the time required to bring the pinion to the proper temperature. Pinions are lapped to the shafts and the fit is relieved at one end to allow for advancing the pinion along the shaft when it is applied.

NEW DEVICES

Protected Type Motor

Motors combining the surplus capacity of the conventional open motor, with protection against dripping liquid, falling metal chips and other foreign matter, have been developed by the Crocker-Wheeler division of Joshua Hendy Iron Works, Ampere, N. J. Rated 40 deg. C. rise, full-load, continuous duty, with a 15 per cent service



The motors are protected against dripping liquid, metal chips and other foreign matter

factor, the motors provide added protection at open motor prices. At present these motors are available in sizes up to and including the 284 frame. Mounting dimensions conform to the standards of NEMA.

There are no openings in the frame or shields above the horizontal center line. This, together with the shielded construction of the ventilating openings, makes the motors suitable for machine-tool and similar applications where other types of enclosures have been required in the past.

Centrifugal seals permit use of softer grease for better lubrication and longer bearing life. Rotors, bars, fans and end rings are cast from aluminum alloy. Frames are of heavy cast construction, coils are protected by vinyl acetal insulation, and front and rear shields are interchangeable.

Blackhall Car Washer

With a background of experience in the installation and operation of 150 Blackhall bus washers for cleaning transit company buses and highway coaches, the Ross and White Company, Chicago, has developed an application of this type of equipment for cleaning railroad passenger train cars. One has recently been installed for the Baltimore & Ohio and the Alton at the West Fifteenth and Loomis Streets track elevation, Chicago.

The Blackhall patent car washer is a stationary machine, bolted securely to concrete foundations. It consists of two H-beam columns on which are supported three brushes on each side—two body brushes for

the cars and one window brush, revolving in opposite directions. Thus, the windows receive cleaning from three brushes on each side. A fan spray with special nozzles wets down the dirt on the car. Then the three brushes, which have water supplied through bell nozzles into the brushes behind the water guards, scrub the dirt off the car. A final cleansing spray washes off the muddy water, leaving the car thoroughly clean.

Located 145 ft. from the washer is a small-nozzle air-operated acid spray, used, when the amount of dirt necessitates this treatment, to supply a certain amount of oxalic acid or cleaner to the sides of the car, without dripping or loss of acid. This works on the dirt while each car is moving a distance of 145 ft. to the washer. When acid is applied, the entrance fan spray is shut off by a valve and the first large body brush rubs the acid onto the surface. The next two brushes (the window and the second side brush) stir this up into a soapy foam which is washed off by a final clean spray.

One of the features of the Blackhall car washer is its use of the Fullergript brush strip, held in split aluminum cores or hubs on the brush shafts, thus facilitating quick renewal when necessary. The large body brushes on each side of the washer are driven by individual waterproof General Electric, 3-hp. motors, with Allis-Chalmers Tex-Rope drives and the small window brushes, by 2-hp. motors.

Cars are run through the washer slowly to get the best washing job. The time required is about 1½ minutes per car. An average of 115 cars are being washed a day, with the Capitol Limited of the Balti-

more & Ohio, consisting of 13 passenger coaches, each 80 ft. long, being washed every morning in 30 min.

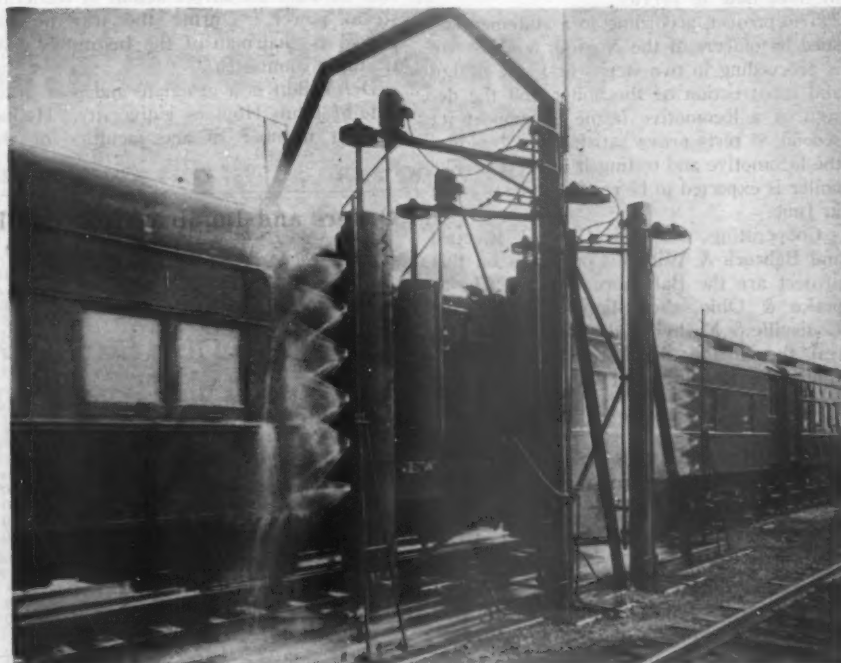
Spray Gun for Cleaning Operations

The DeVilbiss Company, Toledo, Ohio, has announced a new pressure-feed spray gun especially designed for industrial degreasing and cleaning operations on castings, forgings, sheet metal, etc. Operated from a pressure feed tank, the gun handles all kinds of commercial solvents and cleaners, producing a heavy, driving, but well atomized spray that speedily removes dirt and grease. Light in weight and shaped to fit the hand comfortably, this new gun has a two-finger, easy-to-pull trigger designed to reduce hand fatigue. When the trigger is



Spray gun intended for use with solvents and other liquid cleaners

pulled only part way back, air alone is emitted from the nozzle, permitting the gun to be used for both dusting and spraying.



Blackhall patent car washer

NEWS

Norfolk & Western Movie Stars Locomotives

"THE Modern Coal-Burning Steam Locomotive," is the title of a new motion picture produced by the photographic staff of the Norfolk & Western which was recently released for showing before interested audiences. Running time of the film is about 25 minutes and it is available in 16 mm. Kodachrome prints. In it, Del Sharbutt, nationally known radio announcer, tells the story of modern coal-burning steam locomotives as they are built in the railway's shops and maintained and operated over the N. & W. lines. Both the Class J and Class A engines appear in the picture and their low first cost, availability, versatility and economical operation is either pictured or orally emphasized.

Turbine - Electric Locomotive Joint Project Moves Forward

PROGRESS is reported in the cooperative development of a steam-turbine electric locomotive, in which the General Electric Company and the Babcock & Wilcox Company are participating with nine railroads, which has been under way since November 7, 1944. Using pulverized coal as a fuel, steam will be generated at 650 lb. in a high-pressure boiler and will develop 6,900 shaft horsepower in the non-condensing steam turbine which will operate the electric generator. It is anticipated that this fuel will produce a drawbar horsepower hour for two-thirds the fuel required in the most efficient conventional types of steam locomotives now in service.

The project, according to a statement issued by officers of the Norfolk & Western, is proceeding in two steps: first, the design and construction of the boiler and the design of a locomotive frame to support it; second, if tests prove satisfactory, building the locomotive and testing it in service. The boiler is expected to be ready for tests early in June.

Cooperating with the General Electric and Babcock & Wilcox Companies on this project are the Baltimore & Ohio, Chesapeake & Ohio, the Illinois Central, the Louisville & Nashville, the New York Central, the Norfolk & Western, the Pennsylvania, the Reading, and the Virginian.

Perlman Resigns as Research Chairman

A. E. PERLMAN, chief engineer of the Denver & Rio Grande Western and chairman, since its inception, of the sub-committee for engineering and mechanical research of the A. A. R. Railroad Committee for the Study of Transportation, has asked Judge R. V. Fletcher, chairman of the "big committee," to relieve him of the sub-committee chairmanship in view of his

"heavy load of extra-curricular activities added to his normal duties."

In accepting "with great regret the necessity for this action" on Mr. Perlman's part, Judge Fletcher has expressed his appreciation for the "time and talent which has gone into" the retiring chairman's labors for the sub-committee, and has asked H. R. Clarke, chief engineer of the Burlington, to act as chairman of the sub-committee for the time being—at least until the committee can be called together for a further review of the course to be followed in the completion of its assignment.

Dr. Yellott Heads Locomotive Development Committee

DR. JOHN I. YELLOTT has been appointed to direct the \$1,100,000 program of the Locomotive Development Committee consisting of representatives of six railroads, originators of heavy bituminous tonnage, and three bituminous mining companies, which was formulated at a meeting at New York in January as reported on page 88 of the February *Railway Mechanical Engineer*. Bituminous Coal Research, Inc., will handle the research project which is intended to increase the efficiency of the steam locomotive through the use of powdered coal, the development of turbines, and the application of newer steam-power principles.

Dr. Yellott, who will make his headquarters in Baltimore, Md., is now the director of the Institute of Gas Technology of the Illinois Institute of Technology and is the inventor of a method of pulverizing coal through the direct action of moderate steam power. During the war he has served as chairman of the Institute's war-training committee.

Dr. Yellott is a graduate and post graduate of Johns Hopkins University. He has been a member of the faculties of the

University of Rochester and Stevens Institute of Technology and has published many technical papers upon subjects related to steam generation and utilization. He is a member of the American Society of Mechanical Engineers, also of the executive committee of its Power division.

Third Quarter Prospects for Freight and Passenger Cars

For the third quarter of 1945 the War Production Board has allocated to the Office of Defense Transportation 220,000 tons of carbon steel for freight cars, according to a report made to the Railroad Car Builders Industrial Advisory Committee of the W. P. B. at a recent meeting at which a six-to-five vote was cast for the immediate revocation of General Order L-97s limiting the production and delivery of new freight cars. The report was made by D. W. Odiorne, chief of the Transportation Equipment Division's Motive Power and Rolling Stock Section. Mr. Odiorne also informed the committee that O. D. T. has recently requested W. P. B. to allocate materials immediately for the construction of passenger cars at the rate of 250 a quarter.

Mr. Odiorne's comment on the latter, as reported in a W. P. B. release dated May 15, was that "materials prospects for limited passenger-car building in the third quarter of 1945 were good with the possible exception of stainless steel. However, there may be some difficulty in obtaining components immediately but these should be forthcoming in time to permit delivery of cars to start late in 1945."

Meanwhile, Mr. Odiorne estimated that freight-car production in this year's fourth quarter will be 11,000 cars on the basis of the steel allocated for the third quarter, as noted above. He told the committee that (Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the May Issue

| LOCOMOTIVE ORDERS | | | |
|------------------------------------|------------------|------------------------|----------------------|
| Road | No. of locos. | Type of loco. | Builder |
| Long Island | 6 | 600-hp. Diesel-elec. | Electro-Motive |
| New York Central | 51 | 1,000-hp. Diesel-elec. | Electro-Motive |
| Pennsylvania | 3 | 600-hp. Diesel-elec. | Electro-Motive |
| | 2 | 1,000-hp. Diesel-elec. | Electro-Motive |
| Seaboard Air Line | 14 | Diesel-elec. pass. | Electro-Motive |
| LOCOMOTIVE INQUIRIES | | | |
| Road | No. of locos. | Type of loco. | Builder |
| New York Central | 13 | 4-4-4-4 | |
| Texas & Pacific | 2 or 3 | 4-4-4-4 | |
| FREIGHT-CAR ORDERS | | | |
| Road | No. of cars | Type of car | Builder |
| Missouri Pacific | 400 ¹ | 50-ton box | Pullman-Standard |
| | 50 | 70-ton covered hopper | American Car & Fdry. |
| Texas & Pacific | 50 | 70-ton covered hopper | American Car & Fdry. |
| Union Pacific | 500 | 50-ton auto box | |
| PASSENGER-CAR ORDERS | | | |
| Road | No. of cars | Type of car | Builder |
| Richmond, Fredericksburg & Potomac | 8 | | |
| Seaboard Air Line | 30 | | Edw. G. Budd |
| Pennsylvania | 10 | | |

¹ In place of five 600-hp. Diesel-electric locomotives originally ordered in 1942, order for which has been cancelled.

² Experimental.

³ 200 for the St. Louis, Brownsville & Mexico; 200 for the International-Great Northern.

⁴ To cost approximately \$4,500,000. Inquiry reported in the April issue.

Let's replace this picture



with one like this

How much more effectively, more powerfully
can we speed heart-warming homecomings
if all of us back to the limit
the mighty 7th War Loan, two drives in one,
— if we railroad men give the highball
to all-out bond selling among our employees
— to all-out bond buying by ourselves.



ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

220 PARK AVENUE, NEW YORK 17, N. Y. • 445 NORTH SACRAMENTO BOULEVARD, CHICAGO 12, ILL.

Organized To Achieve: Uniform Specifications — Uniform Inspection — Uniform Product

4103

production during the last several months "has been very disappointing," listing deliveries as follows: January, 4,353 cars; February, 4,024; March, 4,842; and April, 3,495. The carry-over as of May 1 was put at 4,823 cars.

Members of the committee, according to W. P. B., attributed the lag in production to "manpower difficulties, primarily absenteeism and work stoppages." As a result of the lag, the committee was told that W. P. B. Chairman J. A. Krug has appointed a task committee to see what can be done to overcome the difficulties.

Army representatives at the committee meeting were reported to have said that the Army program for freight cars in 1946 would be "very modest"—approximately 98,000 cars including 38,250 now being procured for France.

Budd Plans Complete Range of Passenger Cars

At Philadelphia on May 2 Edward G. Budd, president of the Edward G. Budd Manufacturing Company, announced that the company will resume the manufacture of lightweight stainless steel railway passenger cars as soon as man-power and materials are available and will include among its post-war products, cars for both day and night occupancy, as well as all types of recreational facilities required for the well-balanced, all-purpose consist of a train. The program includes resumption of the reserved seat sleeper coaches, or chair cars, as well as dining, lounge, tavern, observation, and several sleeping car types.

"Our designers have ready for the post-war market a comprehensive range of railway passenger cars which will enable us to offer to the railroads of the country complete train consists for day and night traffic, including recreational and revenue-producing units, all of uniform design," Mr. Budd said.

The company will give special attention, he said, to developing car types designed to provide low-cost bedroom service, in line with its policy of furnishing equipment which would help to attract mass travel to the railroads. "We believe both the railroads and the traveling public can best be

served by furnishing commodious coach and luxurious sleeper coach service at coach fares. In addition, we expect there should be a substantial market for sleeping cars which would furnish more luxurious overnight service but still at moderate cost. We expect to use part of our facilities for the manufacture of equipment of this type."

The intensive development of this sort of railroad travel after the war, Mr. Budd expects, will result in maintaining the volume of travel experienced during the war, and thus enforce a great and continued demand for the type of modern, streamlined stainless steel railway cars the Budd company manufactures.

Bureau of Transport Economics Train Performance Data

In a recent issue of its "Monthly Comment on Transportation Statistics," the Bureau of Transport Economics and Statistics, Interstate Commerce Commission, includes an analysis on train performance by kind of locomotive. The figures in this analysis show among other things, that steam locomotives in the first two months of 1945 hauled 92.6 per cent of the total gross ton-miles (excluding locomotives and tenders) as compared with 95.9 per cent in the first two months of 1944. Diesel-electrics hauled 5.6 per cent this year, and 2.2 per cent last year. The Bureau suggests that severe weather in January may have had some influence on the figures, particularly for the East, where "steam operation is high relative to Diesel."

"The average number of gross ton-miles per train-mile (including locomotives and tenders) or gross tons per train in the 1945 period," the statement continues, "was 2,551 for steam locomotive trains as compared with 3,305 for Diesel trains, while the tonnage of locomotives and tenders only was 308 for steam and 381 for Diesel. Per ton of locomotives and tenders the load hauled (cars, contents and cabooses) was 7.28 tons in steam locomotive trains and 7.67 tons in Diesel trains. The average speed of Diesel freight trains in 1945 was 19.4 miles per hour or about 29 per cent greater than that of the steam trains.

"The foregoing figures, of course, are

overall averages. Many Class I roads had no Diesels in the freight service in either period and several others only a very few. The averages, therefore, do not reflect like operating conditions and consequently do not measure satisfactorily the relative performance or efficiency of steam and Diesel locomotives. Based on gross ton-miles, including locomotives and tenders, in the first two months of 1945 nearly two-thirds of the total Diesel freight service was in the Western district."

New Strain Gage Demonstrated by Baldwin Southwark

On May 1, 2 and 3 the Baldwin Locomotive Works, Baldwin Southwark Division, held at the Hotel Statler, Washington, D. C., a conference and demonstration of the use of the SR-4 resistance wire strain gages and electrical indicating equipment. Each day's program consisted of two sessions, one in the morning and one in the afternoon. At the morning sessions the application of the strain gage and its equipment was demonstrated, followed by a discussion of the theory of strain-gage measurements, and of the accessory equipment for indicating and recording strain-gage circuits. The afternoon sessions dealt with dynamic and fatigue testing and included discussions of multi-axial strains and the application of electrodynamics to recording, switching, telemetering, analyzing and fatigue testing.

Because of low first cost and the simple method of attaching the gages they can be applied at many locations on a structure or machine and, by the use of suitable switching equipment, the readings from many locations can be quickly scanned and recorded.

For those unable to attend during the day one evening session was held on May 2. Each day's sessions were attended by some 300 persons representing the armed forces, the Maritime Commission, members of the teaching staffs of local colleges and universities, railroad men, and others. A series of similar conferences have been arranged for a number of other cities, some of which have already been held.

Supply Trade Notes

STROMBERG-CARLSON COMPANY.—*Carl G. Howard* has been appointed railroad sales representative of the Stromberg-Carlson Company, with headquarters in Chicago as heretofore.

CHAMPION RIVET COMPANY.—The Champion Rivet Company of Cleveland, Ohio, and East Chicago, Ind., during the month of April celebrated its fiftieth anniversary.

BENDIX AVIATION CORPORATION.—*Arthur C. Omberg* has been appointed chief research engineer and *Dr. Harold Goldberg*,

research engineer of the Bendix Radio division of the Bendix Aviation Corporation, Baltimore, Md. Mr. Omberg will be in charge of all Bendix Radio long-term product development and electronic research in radio, radar, and television.

COPPERWELD STEEL COMPANY.—*John J. Healy*, who has been with the Army Air Forces for the past 33 months and holds the rank of captain, has been assigned to inactive duty and has returned to the Copperweld Steel Company as northwest representative. He will serve under the jurisdiction of Copperweld's Chicago office and will cover the states of Minnesota,

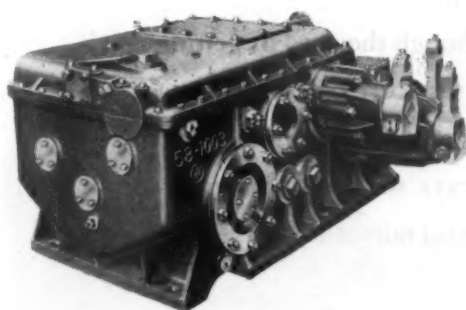
North and South Dakota, Montana, the upper peninsula of Michigan and the northern portion of Wisconsin—the territory he covered prior to his enlistment.

SCULLIN STEEL COMPANY.—*R. C. Geekie*, assistant to the president in charge of sales, has been elected vice-president in charge of sales of the Scullin Steel Company. *B. L. Norton*, sales agent in New York, has been appointed assistant vice-president, with offices in New York. *F. H. Spenner*, chief mechanical engineer, has been appointed assistant vice-president in charge of engineering.



The Pennsylvania Railroad's New Multiple Cylinder Locomotives for Passenger or Freight Service

are equipped with **THE FRANKLIN SYSTEM OF STEAM DISTRIBUTION**



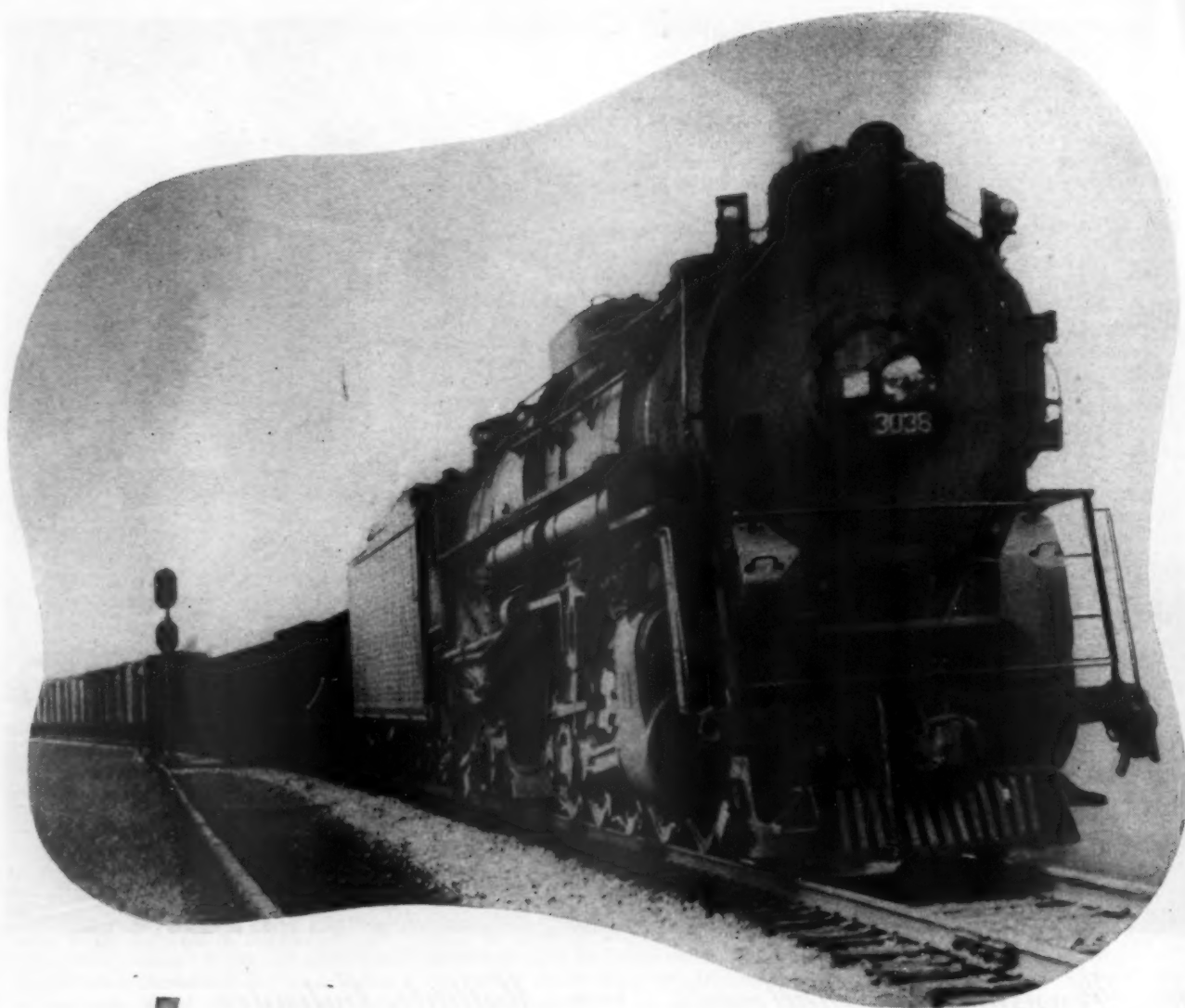
The Pennsylvania Railroad is to be congratulated on the development of these streamlined giants. These locomotives develop more horsepower at 100 miles per hour than any other engines ever built. Franklin is proud that its System of Steam Distribution is one of the contributions to this achievement.



FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK • CHICAGO

In Canada: **FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL**



TO **Increase** FREIGHT CAR AVAILABILITY

LIMA Steam Locomotives, by enabling railroads to maintain faster freight schedules, do more than cut down delivery time that may be vital to the war effort.

They also greatly increase freight car availability by reducing the

hours between loading point and destination.

Although the need of getting maximum service from every freight car is spotlighted by wartime emergencies, it always will be a vital factor in successful railroading.

LIMA LOCOMOTIVE WORKS



INCORPORATED, LIMA, OHIO

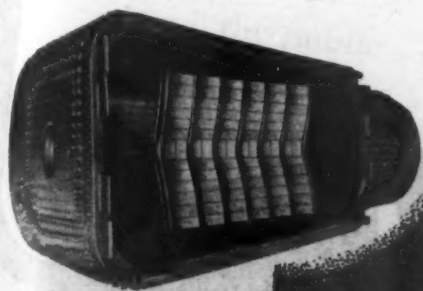
Nothing

CAN REPLACE THE
ENGINEMAN'S **EYE!**

Never was it more important for the locomotive crew to watch water glasses and gauge cocks to make certain there is adequate water in the boiler. Nothing can take the place of this everyday operating routine.

But if an emergency involving low water does occur, the locomotive equipped with Security Circulators has additional protection.

Not only do Security Circulators strengthen the firebox structure, but they also insure a positive circulation of water over the center of the crown sheet.



AMERICAN ARCH COMPANY, INC.

NEW YORK • CHICAGO

SECURITY CIRCULATOR DIVISION

IT'S A GREAT NEW DAY FOR RAILROADING

ADD SOMETHING NEW



GENERAL MOTORS
LOCOMOTIVES

IT'S A GREAT NEW DAY FOR RAILROADING



One way to meet—and surpass—
various forms of competitive freight
and passenger service after the war
is to *add something new.*

To America's finest railroads, that means
full utilization of Diesel power
in the form of General Motors Diesel
passenger and freight locomotives.

Their impressive records, as well as
their colorful and ultramodern
appearance, certainly capture and hold
the public's imagination.

ON TO FINAL VICTORY ★ BUY MORE WAR BONDS

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS CORPORATION

LA GRANGE, ILL.

TIMKEN ROLLER BEARING COMPANY.—*Tracy V. Buckwalter* has retired as chief engineer and vice-president of the Timken Roller Bearing Company, but will continue in a consulting capacity. *Albert L. Bergstrom* has been elected vice-president of all engineering of the company. *O. J. Horger*, formerly in charge of railway engineering and research, has been appointed chief engineer of the railway division; *C. L. Eastburg*, who has been in active charge of the design of bearings and parts as applied to locomotives, has been appointed assistant chief engineer of the



Tracy V. Buckwalter

railway division, and *P. C. Paterson*, who has been active in the inspection and procurement of material and in equipment applications, has been appointed manager of the division.

Tracy V. Buckwalter joined the Timken Company in 1916 as chief engineer after 16 years in the Altoona, Pa., shops of the Pennsylvania, where he developed the motor baggage truck bearing his name. He was elected vice-president of Timken in 1925 and thereafter devoted a large part of his time to the company's railroad activities. He developed the application of Timken bearings to passenger- and freight-car journals and for passenger and freight locomotives. Under his direction, the company built a high-speed passenger- and freight locomotive all axle journals of which were equipped with Timken bearings. This locomotive was loaned to many of the railroads and gave immediate stimulus to the application of roller bearings to driving-axle journals. Mr. Buckwalter is the author of the following publications: "Roller-Bearing Service in Locomotive, Passenger and Freight Equipment"; "Locomotive Axle Testing"; "Investigation of Fatigue Strength of Axles, Press-Fits, Surface Rolling and Effect of Size"; "Stress Analysis of Locomotive and Other Large Axles"; "Locomotive Axle and Wheel Research"; and "Steam Locomotive Slipping Tests."

Albert L. Bergstrom is a graduate, with a degree in mechanical engineering, of the Royal Technical Institute in Stockholm, Sweden. He came to this country in 1924, and was appointed designing engineer for the Stearns Conveyor Company of Cleveland, Ohio. He joined the Timken Company as development engineer in 1929 and was given various engineering and de-

velopment assignments. He was later appointed chief works engineer, and, in 1938, became executive engineer.

PRESSED STEEL CAR COMPANY.—*Ernest Murphy*, vice-president in charge of operations of the Pressed Steel Car Company, has been elected president to succeed *John F. MacEnulty*, who becomes vice-chairman of the board of directors. The sales department continues under the direct jurisdiction of Mr. MacEnulty. *Ernest Murphy* was born in Padiham, England, and received his early education and training in that country. He came to this country in 1909 and worked on type M control electrical difficulties on the Chicago elevated lines. Later in that year he went to Pittsburgh, Pa., where he worked for the Butler, Pittsburgh, Harmony & New Castle Interurban Traction Company as division engineer in charge of construction. After the construction assignment was finished, Mr. Murphy was appointed in charge of operation and the training of operating personnel. He came to New York in 1911, where he was placed in charge of the extensions of the subway, the design and building of rolling stock, and of the construction of the shops and the equipment of the trains of the Interborough Rapid Transit Company. He assisted in the development of the electrical coupler, the installation of electrical brakes on all trains, and the development of the electrical synchronizing of all train air compressors. With the New York Railway Company, he had direct supervision of all rolling stock and maintenance plants. From 1917 to 1940 he was associated with the United Traction Company at Albany, N. Y., starting as superintendent of equipment and becoming successively assistant general manager, general manager and vice-president. At the same time, he also was president of the Capital District Transportation Company in Albany. Since March, 1941, Mr. Murphy has been located



John F. MacEnulty

at the Hegewisch (Chicago) plant of the Pressed Steel Car Company, in charge of the Armored Tank division.

John Forest MacEnulty received his early education in Pittsburgh, Pa. He began his career in the bureau of inspection of the Carnegie Steel Company, Pitts-

burgh, in 1892 and entered the employ of the Pittsburgh Testing Laboratories in 1895. He joined the Pressed Steel Car Company at its Allegheny plant in February, 1899, as a member of the inspection force. He later became chief inspector and then engineer in charge of construction. He was transferred to New York in 1904 as sales representative, and, in 1907, to Chicago as general superintendent of the Hegewisch plant of the Western Steel Car & Foundry Company, a subsidiary. Mr. MacEnulty was appointed general manager in 1909; returned to New York in 1912 as general sales manager of the



Ernest Murphy

Pressed Steel Car Company and the Western Steel Car & Foundry Company; in 1916 was appointed vice-president in charge of sales, and in December, 1937, was elected president of Pressed Steel.

BUDA COMPANY.—The Buda Company, Harvey, Ill., has opened new sales and service offices at Portland, Me.; Cincinnati, Ohio; Columbia, S. C., and Regina, Sask.

GENERAL AMERICAN TRANSPORTATION CORPORATION.—*Sam Laud*, executive assistant to the president, has been elected president of the General American Transportation Corporation to succeed *Lester N. Selig*, who has been elected to the newly created position of vice-chairman of the board. *Max Epstein* is chairman of the board. *W. S. Hefferan, Jr.*, formerly secretary of the company, and *Arthur W. Lissauer*, general manager of the process equipment division, have been elected vice-presidents; *Maurice J. Feldman* has been elected secretary, and *Frank E. Selz* has been appointed assistant to the president.

Frank E. Selz was born at Chicago on December 29, 1892, and is a graduate of Yale University. He entered the service of General American in February, 1931, being employed in the corporation's plant at East Chicago, Ind. One year later he became a salesman in the refrigerator car department, with headquarters at Chicago. In 1935 Mr. Selz was elected a vice-president of the General American Pre-cooling Corporation, a subsidiary of General American, and in 1936 became sales executive of the tank car department of the parent company.

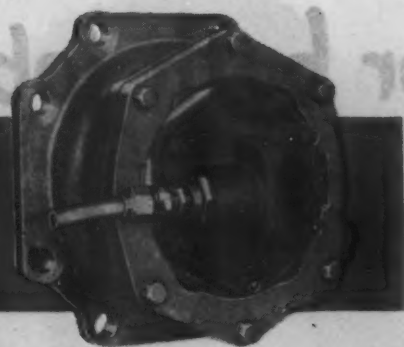
Undercover

Operation

On the

“AP”

Decelostat

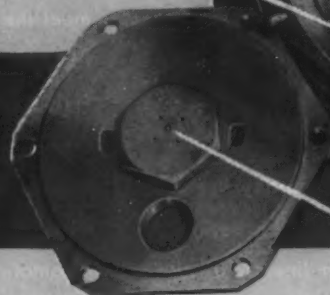


SOFTENS THE BRAKE
WHEN WHEEL SLIP IMPENDS

Spring Cam

Inertia Wheel

Rollers



Pilot Valve

UNDER-THE-COVER inspection of the “AP” Decelostat reveals simplicity achieved by mechanical-pneumatic design. Greater operating reliability naturally stems from design simplification. All apparatus is confined to the truck — initial

installation is simplified, less costly. No connections required between truck and car body; maintenance is reduced to a minimum. These features are derived from mechanical-pneumatic design and add up to efficient, dependable wheel slip control.

Westinghouse Air Brake Company
Wilmerding, Pa.

Right for both jobs because it's built for both jobs



THE trains you see on these two pages are being pulled by the New York Central's new dual-purpose locomotive, the "Niagara."

Built by the American Locomotive Company, in close co-operation with the New York Central, it is designed to pull the System's crack passenger liners and also

meet the demands for high speeds in hauling freight. Locomotives that possess the *interchangeability* of the "Niagara" promise many benefits. They can help reduce the expense many railroads have had to bear in buying, operating and maintaining powerful locomotives for heavy freight hauls and faster, less powerful locomotives for lighter passenger runs.





They can provide a new kind of operating efficiency by building up extra power needed for tough jobs, and conserving power on the easier tasks.

And, perhaps most important of all, they can open new roads to undreamed-of economies—savings that will be shared by thousands.

American Locomotive



THE MARK OF MODERN LOCOMOTION

LINCOLN ELECTRIC COMPANY.—*Gorham W. Woods*, for the past three years process engineer of the Dickson gun plant of the Hughes Tool Company of Houston, Tex., has been appointed research engineer of the Lincoln Electric Company, Cleveland, Ohio.

AMERICAN BRAKE SHOE COMPANY.—*William A. Maxwell*, general sales manager of the P. & M. Company since 1931, has been appointed Chicago district sales manager of the Ramapo Ajax division of



William A. Maxwell

the American Brake Shoe Company. Mr. Maxwell attended Nebraska University. Except for a period of service in the Navy during the last war, he had been associated with the P. & M. Company since 1917.

J. L. Mullin, general superintendent of foundries, has been appointed vice-president in charge of operations of the American Manganese Steel division of the American Brake Shoe Company, with headquarters in Chicago. Mr. Mullin has



J. L. Mullin

been associated with the manganese-steel industry since 1914, when he joined the Edgar Allen Manganese Steel Company, predecessor of the present Brake Shoe division, as a clerk in the annealing department. He then served successively as local purchasing agent, foundry superintendent, works manager at the New Castle, Del., plant, and general superintendent of foundries.

DUFF-NORTON MANUFACTURING COMPANY.—*Walter I. Floyd*, formerly executive vice-president, has been elected presi-



Walter I. Floyd

dent of the Duff-Norton Manufacturing Company to succeed *Robert G. Allen*, who has resigned. *E. M. Webb* has been elected vice-president and general manager.

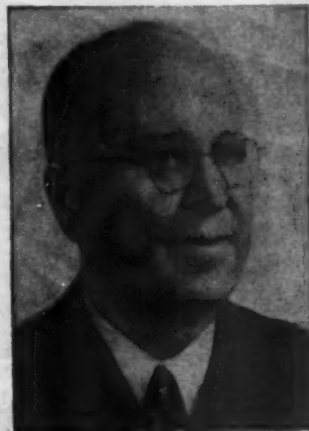
BALDWIN LOCOMOTIVE WORKS OF CANADA, LTD.—The Baldwin Locomotive Works has formed a wholly owned Canadian subsidiary, the Baldwin Locomotive Works of Canada, Ltd., to market there



W. N. Brownlie

such Baldwin products as turbines, water wheels, hydraulic presses, power tools and Diesel engines. *W. N. Brownlie*, formerly chief engineer of the Mutual Boiler Insurance Company of Boston, Mass., has been appointed managing director, with headquarters soon to be opened in Toronto. The new subsidiary will subcontract its orders to the United Steel Company, Ltd., which has four plants in Eastern Canada and headquarters in Toronto. All production will be under the general supervision of Baldwin of Canada and will be from Baldwin designs and specifications. Other officers of the new company, all of whom are officers of the parent company, include *Ralph Kelly*, president; *W. Horace Holcomb*, vice-president; *H. D. Humphreys*, secretary and treasurer, and *T. E. McFalls*, assistant secretary and assistant treasurer.

REYNOLDS METALS COMPANY.—*Frank J. Swanson* has been appointed sales and service engineer of the railway supply division of the Reynolds Metals Company, Richmond, Va. His headquarters will be in Chicago. For the past three years, Mr. Swanson has served in the mechanical division of the Office of Defense Transportation, Division of Railway Transport. He began his career with the Chicago, Milwaukee, St. Paul & Pacific in 1905, working in the car department at Chicago, Milwaukee, Wis., and Minneapolis, Minn., and in various clerical positions. He served an



Frank J. Swanson

apprenticeship as a carman and subsequently became assistant car foreman, car foreman, general car foreman, assistant shop superintendent, and general car department supervisor. Mr. Swanson joined O. D. T. in June, 1942.

STANDARD RAILWAY EQUIPMENT COMPANY.—*Nicholas H. Arnold* has been appointed assistant to the vice-president of the Standard Railway Equipment Company,



Nicholas H. Arnold

with headquarters at Chicago. Mr. Arnold was previously connected with the Missouri Pacific at St. Louis, Mo., where he held various supervisory positions in the car department for nearly 18 years. In 1943 he was appointed to the United States Railway Mission in Mexico where he assisted in the rehabilitation program of the National Railways of Mexico.

NATIONAL MALLEABLE & STEEL CASTINGS COMPANY.—*Herbert L. Mausk* has been appointed manager of railway sales of the National Malleable & Steel Castings Com-



Herbert L. Mausk

pany. *George R. Farrell* succeeds Mr. Mausk as Cleveland district sales manager and the Cleveland territory has been extended to include the Pittsburgh, Pa., district.

Herbert L. Mausk joined National Malleable in the drafting department in 1907, rising to the position of assistant chief draftsman. In 1918 he was assigned to the company's Washington, D. C., railway sales office to assist in engineering work, and later was appointed sales agent in that territory. He returned to the general offices in Cleveland, Ohio, for special engineering work in 1931, and was appointed Cleveland district sales manager in 1933.



George R. Farrell

George R. Farrell joined National Malleable in 1907 as an inspector of railroad materials. In 1912 he was appointed to the service department in connection with the railway sales division of the company's business, and in 1922 was appointed sales agent and assigned to the Philadelphia, Pa., office.

♦ **STANDARD STOKER COMPANY.**—*E. Archer Turner*, vice-president and general manager, has been elected president of the Standard Stoker Company to succeed *H. P. Farrington*, who becomes chairman of the board. Mr. Farrington will continue ac-

tive in the executive management. Mr. Turner, who has been associated with the locomotive stoker industry since 1918 and with the Standard Stoker Company since 1928, will make his headquarters in New York. *Karl W. Mueller*, technical assistant to the general manager, has been appointed works manager at Erie, Pa., and *Charles J. Surdy*, executive assistant to the general manager, has been appointed assistant to the president.

♦ **ELECTRO METALLURGICAL COMPANY.**—*W. E. Remmers*, vice-president of the Electro Metallurgical Sales Corporation, has been elected vice-president of the Electro Metallurgical Company, a unit of the Union Carbide & Carbon Corp.

♦ **JONES & LAUGHLIN STEEL CORPORATION.**—*J. O'H. Anderson*, manager of sales, tubular products, and *H. B. Spackman*, dis-



J. O. H. Anderson

trict sales manager at Philadelphia, Pa., have been appointed assistant general managers of sales. *V. A. Jevon*, assistant general manager of sales, has been placed in charge of Pittsburgh, Pa., district sales office activities. *C. T. Hapgood*, formerly assistant manager of sales, tubular products, has been appointed manager of sales, tubular products. *E. W. Harwell*, formerly district sales manager at Chicago, has been appointed district sales manager, with headquarters at Philadelphia, Pa. *L. C. Berkey*,



H. B. Spackman

formerly district sales manager at St. Louis, Mo., has been appointed district sales manager, with headquarters at Chicago. *C. C. Wehling*, formerly district sales man-



V. A. Jevon

ager at Pittsburgh, Pa., has been appointed district sales manager, with headquarters at St. Louis, Mo.

The district office of Jones & Laughlin and the office of Jones & Laughlin Supply Company at Chicago have been changed to the Field Building, 135 South LaSalle street, Chicago 3.

♦ **UNION SWITCH & SIGNAL COMPANY.**—*T. B. Clement* has been elected executive vice-president; *M. L. Gray*, vice-president and export manager; and *R. H. Wood*, general manager, of the Union Switch & Signal Company, all with headquarters at the company's offices in Swissvale, Pa. *George W. Baughman*, assistant chief engineer in charge of electronics, has been appointed chief engineer. *George W. Baughman* is a graduate of Ohio State University with a degree in electrical engineering (1920). He was awarded the professional electrical engineering degree in



George W. Baughman

1924. From 1920 to 1923, he was employed in the development laboratories of the Bell Telephone System. He began work with the Union Switch & Signal Company in 1923 and from then until July, 1944, was engaged chiefly in field-development work associated with railway signaling and braking. He was appointed assistant chief engineer in charge of electronics in July, 1944.



Let's get *down to earth*
on train communication

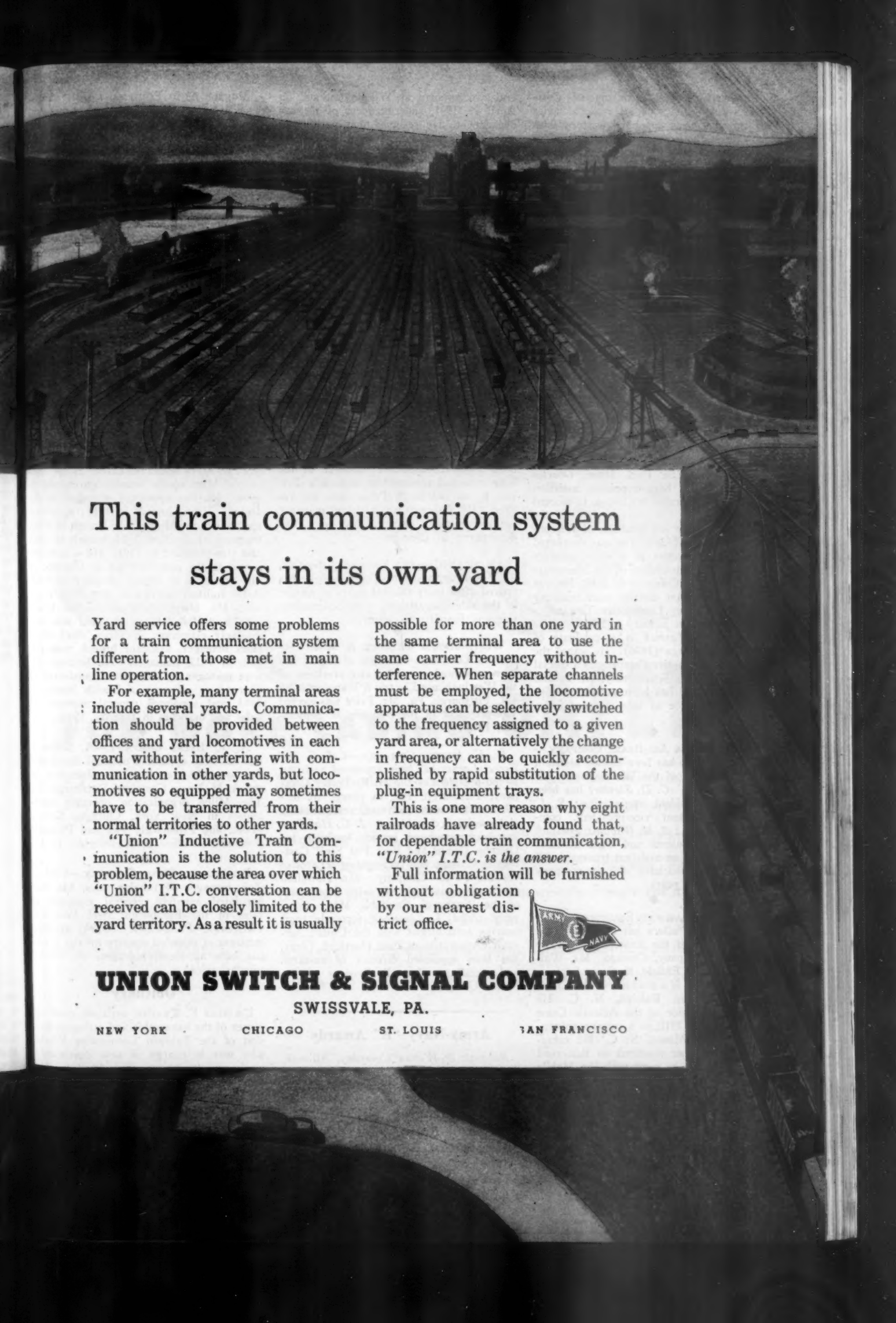
"UNION"

I.T.C.
INDUCTIVE TRAIN COMMUNICATION

Dependable voice communication

"Union" I.T.C. (Inductive Train Communication) system provides dependable, practicable two-way voice communication between vehicles of a train, between trains, and between trains and wayside points.

It is a train communication system designed exclusively for railroad use, by men who know railroad needs, and proved through years of regular railroad service.



This train communication system stays in its own yard

Yard service offers some problems for a train communication system different from those met in main line operation.

For example, many terminal areas include several yards. Communication should be provided between offices and yard locomotives in each yard without interfering with communication in other yards, but locomotives so equipped may sometimes have to be transferred from their normal territories to other yards.

"Union" Inductive Train Communication is the solution to this problem, because the area over which "Union" I.T.C. conversation can be received can be closely limited to the yard territory. As a result it is usually

possible for more than one yard in the same terminal area to use the same carrier frequency without interference. When separate channels must be employed, the locomotive apparatus can be selectively switched to the frequency assigned to a given yard area, or alternatively the change in frequency can be quickly accomplished by rapid substitution of the plug-in equipment trays.

This is one more reason why eight railroads have already found that, for dependable train communication, *"Union" I.T.C. is the answer.*

Full information will be furnished without obligation by our nearest district office.



UNION SWITCH & SIGNAL COMPANY

SWISSVALE, PA.

NEW YORK

CHICAGO

ST. LOUIS

SAN FRANCISCO

EDWARD G. BUDD MANUFACTURING COMPANY.—*John E. Wright*, regional sales manager has been appointed western sales manager of the Edward G. Budd Manufacturing Company's railway car division, with headquarters in Chicago. *Fitzwilliam Sargent*, regional sales manager, has been appointed eastern sales manager. *Samuel F. Felton*, sales manager, has resigned. *Thomas J. Henkle*, special representative at Chicago, has retired after 27 years of service with the Budd organization. Mr. Henkle had previously served as western sales manager.

LOCOMOTIVE FINISHED MATERIAL COMPANY.—*R. A. Philabaum*, a former employee of the Wabash and of the New York Central, has been appointed a service representative of the Locomotive Finished Material Company, Atchison, Kan., with headquarters at Chicago.

AMERICAN LOCOMOTIVE COMPANY.—*Paul D. Curtis* has been placed in charge of a new sales office opened by the American Locomotive Company in the First National Bank Building, St. Paul, Minn. *Charles F. Venrick* has been appointed assistant district sales manager in Chicago to succeed Mr. Curtis.

Paul D. Curtis is a graduate of Wisconsin University (1928). He was connected with coal companies in a sales capacity until he became president of the Marquette Railway Supply Company in 1939. He was appointed assistant district sales manager of the American Locomotive Company's Chicago office on January 1, 1941.

Charles F. Venrick is a graduate of Dartmouth College (1936). He joined the American Locomotive Company as a special apprentice at the Schenectady, N. Y., and other plants and has been associated with the Chicago office as sales representative since 1938.

WESTINGHOUSE AIR BRAKE COMPANY.—*Herbert A. May* has been elected assistant to the president of the Westinghouse Air Brake Company. *C. D. Stewart* has been elected vice-president, engineering; *S. L. Poorman*, assistant vice-president, commercial activities; *A. M. Wiggins*, assistant vice-president, patents and legal matters; and *J. S. Smith*, an assistant treasurer. All five have been associated with the company for a number of years.

ENTERPRISE RAILWAY EQUIPMENT COMPANY.—*O. A. Wallace* has been appointed sales engineer of the Enterprise Railway Equipment Company, Chicago. Mr. Wallace was born at Enfield, N. C., on September 29, 1889, and is a graduate of the King's Business College, Raleigh, N. C. He entered the service of the Atlantic Coast Line on May 8, 1910, as a carman apprentice at Rocky Mount, N. C. He subsequently held other positions on that road until 1918 when he went with the Mobile & Ohio (now the Gulf, Mobile & Ohio) as a traveling car inspector, with headquarters at Mobile, Ala. In 1921, Mr. Wallace returned to the Atlantic Coast Line as a general car inspector at Waycross, Ga. In 1924 he became supervisor of car repairs, at Wilmington, N. C.; in 1938 system gen-

eral car foreman at Wilmington and on April 19, 1941, superintendent of the car department. He resigned that position to enter the service of the Enterprise Railway Equipment Company.

OKONITE COMPANY.—*Robert B. Zane* has been appointed district engineer of the Chicago sales office of the Okonite Company. Mr. Zane is a graduate of Illinois University with a degree in electrical engineering (1932). He joined the Okonite Company as a research engineer in the Passaic, N. J., laboratories. Three years later he was transferred to sales engineering in the company's Chicago office, and in 1943, returned to the factory to participate in development work on high frequency and radar cables for the Army and Navy.

AMERICAN STEEL & WIRE COMPANY.—*Robert E. Cramer*, engineer of appropriations and properties, has been appointed chief engineer of the American Steel & Wire Company, a United States Steel subsidiary, to succeed *E. J. Reardon*, who recently resigned. *Myron E. Capouch* has been appointed assistant manager of the wire rope and construction materials division to succeed *B. S. Pease*, who has retired. Mr. Capouch was assistant manager of the company's electrical and wire rope department in Chicago.

AMERICAN CAR AND FOUNDRY COMPANY.—*F. F. Rose*, assistant vice-president, has retired after more than 44 years of service in the sales department of the American Car and Foundry Company.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.—*Gwilym A. Price* has been appointed executive vice-president of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa. Mr. Price was elected vice-president of the company in September, 1943.

H. K. PORTER COMPANY.—*Col. G. de-Freest Larnier* has been appointed assistant to the president of the H. K. Porter Company, Pittsburgh, Pa., in charge of termination of war contracts, renegotiation, and special tax problems. *J. C. Hamilton* has been appointed service engineer for Quimby Pumps and Fort Pitt Steel Castings in Chicago and surrounding territories for the Porter Company. Mr. Hamilton previously was with the sales department of the Pittsburgh Equitable Meter Company. *John A. Comstock*, formerly engineering metallurgist with the United Aircraft Corporation of East Hartford, Conn., has been appointed director of research and metallurgy for all divisions of the Porter Company.

MONROE AUTO EQUIPMENT COMPANY.—The Monroe Auto Equipment Company, Monroe, Mich., has purchased a private Pullman car for test purposes in further developing and improving vertical and horizontal shock absorbers, sway bars, anti-galloping devices and other equipment designed to improve the riding qualities of railroad cars.

CRANE COMPANY.—*P. R. Mork*, vice-president in charge of sales, has been elected executive vice-president of the Crane Company, Chicago, and *J. A. Dwyer*, general manager of sales and branches, has been elected vice-president in charge of sales. *Lucien W. Moore* has been appointed general manager of sales and branch houses to succeed Mr. Dwyer. *F. J. Wilkey*, district manager, Chicago, has been appointed manager of the valve and fitting department, the position occupied by Mr. Moore until his recent assignment to a special mission in France by the War Department. Mr. Moore will assume his new duties on completion of his present mission for the government.

P. R. Mork began his career in the company's Minneapolis branch warehouse in 1901. He was appointed manager of the Duluth, Minn., branch in 1911; appointed manager of the Minneapolis branch in 1924; manager of the New York branch in 1927, and vice-president in 1931. He was transferred to the general office in Chicago as vice-president in charge of sales in 1934. After military service in the first world war, Mr. Dwyer returned to the Crane branch in Philadelphia, Pa., and was successively estimator, salesman, chief clerk, sales manager, assistant branch manager, and, in 1935, manager. He became district manager in 1937, was transferred to Chicago as manager of branch houses in 1943, and appointed general manager of sales and branches in January, 1944.

A. M. BYERS COMPANY.—*A. Milne & Co.* has been appointed national distributor for wrought-iron bars manufactured by the A. M. Byers Company, Pittsburgh, Pa. The Milne organization operates warehouses in New York, Chicago, Boston, Mass., and Pittsburgh, Pa., and Philadelphia, and an office in Washington, D. C.

PITTSBURGH STEEL COMPANY.—*Carl L. Zak*, manager of tubular sales, has been appointed assistant general manager of sales of the Pittsburgh Steel Company, Pittsburgh, Pa. *E. R. Smith*, assistant manager of sales, oil country tubular goods, has been appointed manager, oil country tubular sales.

Obituary

CHARLES F. KRAUSS, assistant chief engineer of the locomotive and ordnance division of the Baldwin Locomotive Works, who was in charge of new development work on locomotives, died April 6. Mr. Krauss had been associated with Baldwin for 40 years, starting in the engineering department. He attended the Drexel Institute of Technology and was a member of the technical committee of the Locomotive Institute and of several committees of the Association of American Railroads.

Army-Navy "E" Awards

Babcock & Wilcox Company, Alliance, Ohio. Third renewal.

Electric Storage Battery Company, Philadelphia, Pa. Fifth star.

Maxim Silencer Company, Hartford, Conn. Third star.

Standard Stoker Company, New York. Renewal.

(Turn to next left-hand page)

THE TRUCK FOR TODAY'S NEED... TOMORROW'S SPEED!



FOR MORE LADING SAFETY!

LONG SPRING TRAVEL
CONSTANT FRICTION CONTROL

Today's climbing loss-and-damage figures are variously laid to the inevitable effects of war—acute shortage and rapid turnover of labor; increasing use of worn and reused containers; inadequate packaging; and inattention to sound freight-handling practices. Each *is* a contributory factor. And there is one more—the freight car itself or, more specifically, the *trucks* on which it rides. Much in this direction *can* be done to ease freight smoothly along the rails despite wartime difficulties. The A. S. F. Ride-Control Truck (A-3) gives freight a smooth, easy ride.

AMERICAN STEEL FOUNDRIES

CHICAGO

MINT-MARK OF FINE CAST STEEL



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Personal Mention

General

F. E. WEAVER has been appointed Diesel locomotive inspector of the New York Central, with headquarters at New York.

C. L. HALL has been appointed assistant supervisor of Diesel locomotive maintenance of the New York Central, with headquarters at New York.

F. K. BARTHOL has been appointed Diesel locomotive inspector of the New York Central, with headquarters at New York.

J. E. GOODWIN, assistant chief mechanical officer of the Chicago & North Western, has been appointed chief mechanical officer with headquarters at Chicago.

T. F. POWERS, chief mechanical officer of the Chicago & North Western at Chicago, has been appointed assistant to the vice-president, at Chicago.

G. W. BOHANNON, assistant to the chief mechanical officer of the Chicago & North Western, has been promoted to assistant chief mechanical officer at Chicago.

RAMSEY GRAY GAGE, chief electrical engineer of the Canadian National at Montreal, Que., has retired.

HAROLD FORSYTH FINNEMORE, assistant chief electrical engineer, has been appointed chief electrical engineer of the Canadian National at Montreal, Que.

NORCUM ARTHUR PEEBLES has been appointed electronic engineer of the Atlantic Coast Line with headquarters at Wilmington, N. C.

HAROLD C. WRIGHT, master mechanic of the Altoona works of the Pennsylvania at Juniata, Pa., has been appointed superintendent of motive power, Eastern Ohio division, with headquarters at Pittsburgh, Pa.

C. P. KAHLER, electrical engineer of the Union Pacific at Omaha, Neb., has been promoted to general electrical engineer, with headquarters at Omaha.

JOHN MILES NIXON, whose appointment as superintendent, motive power of the Macon, Dublin & Savannah at Macon, Ga., was announced in the May issue, was born at Rhine, Ga., on February 3, 1901, and entered the service of the Georgia & Florida in November, 1918, as an apprentice machinist at Douglas, Ga. In 1920, he became a machinist in the employ of the Atlanta, Birmingham & Atlantic (now the Atlanta, Birmingham & Coast) at Fitzgerald, Ga., and later served as a machinist on the Southern, the Atlanta & St. Andrews Bay, and the Cincinnati, New Orleans & Texas Pacific (part of the Southern). In March, 1926, he entered the employ of the Florida East Coast as head machinist at Miami, Fla., and became inspector in September, 1932. In May, 1937, he became a machinist for the Seaboard Air Line at Jacksonville, Fla., and later served at Miami, Fla. Mr. Nixon was appointed enginehouse foreman at Wildwood,



John Miles Nixon

Fla., in January 1941. In April, 1942, he was promoted to general foreman. He relinquished the latter position to become superintendent, motive power of the Macon, Dublin & Savannah at Macon.

A. G. TRUMBULL, chief mechanical engineer of the Advisory Mechanical Committee of the Chesapeake & Ohio, the New York, Chicago & St. Louis, and the Pere Marquette with headquarters at Cleveland, Ohio, has been appointed general mechanical engineer of the three roads at Cleveland, in addition to his regular duties.

Master Mechanics and Road Foremen

CLAIR I. CLUGH, master mechanic of the Philadelphia Terminal division of the Pennsylvania at Philadelphia, Pa., has been transferred to the position of master mechanic, Pittsburgh, Conemaugh and Monongahela divisions, with headquarters at Pitcairn, Pa.

HERBERT J. KLEINE, master mechanic of the Pittsburgh, Conemaugh and Monongahela divisions of the Pennsylvania at Pitcairn, Pa., has been transferred to the position of master mechanic at the Altoona works, Juniata, Pa.

G. M. DUCK, traveling master mechanic of the Gulf, Mobile & Ohio, has been appointed master mechanic of the Northern division, with headquarters at Jackson, Tenn.

E. D. BURKE, district foreman of the Union Pacific, at La Grande, Ore., has been promoted to assistant master mechanic, with headquarters at Cheyenne, Wyo.

C. T. ARMSTRONG, assistant master mechanic of the Union Pacific at Cheyenne, Wyo., has been transferred to the position of assistant master mechanic at North Platte, Neb.

Car Department

OREL C. FARISS has been appointed superintendent, car department, of the Virginian, with headquarters at Princeton, W. Va.

CARL J. ANDERSON, assistant passenger car foreman of the Union Pacific at Omaha, Neb., has been promoted to general car inspector, with headquarters at Omaha.

Shop and Enginehouse

F. B. DOWNEY, assistant shop superintendent of the Chesapeake & Ohio, has been appointed superintendent of the shops at Huntington, W. Va.

E. A. MURRAY, shop superintendent of the Chesapeake & Ohio at Huntington, W. Va., has retired after 55 years of continuous service.

Obituary

GEORGE MCCORMICK, who retired in 1942 as general superintendent of motive power of the Southern Pacific, with headquarters at San Francisco, Calif., died at Houston, Tex., on April 5. Mr. McCormick was born at Columbus, Tex., on July 15, 1872, and was a graduate in mechanical engineering of the Agricultural and Mechanical College (now Texas A. & M.) at Bryan, Tex., in 1891. He entered railway service on October 5, 1891, as a machinist apprentice with the Galveston, Harrisburg & San Antonio (now part of the Southern Pacific Lines in Texas and Louisiana) at Houston, later being promoted to draftsman in 1893 and transferred to San Antonio in 1894. He returned to Houston in 1895 as chief draftsman. In 1900 he was appointed mechanical engineer; in December, 1911, assistant superintendent of the El Paso division, with headquarters at El Paso, Tex.; in February, 1913, assistant general manager (mechanical) of the Southern Pacific, Texas lines, with head-



George McCormick

quarters at Houston, and in December, 1916, general superintendent of motive power. More complete biographical data concerning the training and accomplishments of Mr. McCormick, who received the honorary degree of Doctor of Engineering at Texas Agricultural & Mechanical College in 1941, appeared in the January, 1942, issue of the *Railway Mechanical Engineer*, beginning on page 15.

Whatever you call it...

detergency dispersancy or peptizing action

Nonpareil HD has that quality which keeps Diesels clean

The quality in a truly HD (heavy-duty) oil that keeps Diesel engines clean has been given many names—detergency, dispersancy, or peptizing action are some. Regardless of the name you give it, *what* that quality is, and *why* it keeps engines clean, are of utmost importance to Railroad Diesel operators.

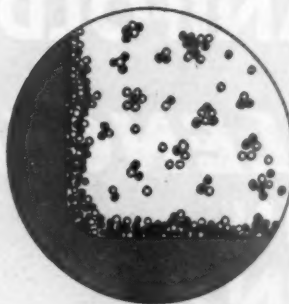
A simplified description at the right explains the difference between conventional, oxidation-inhibited oils, and one that has *both* added oxidation inhibiting and detergency properties—such as Nonpareil HD. It explains why Nonpareil HD keeps engines free from varnish and other engine deposits, even under severe demands.

You can get much more positive and convincing proof of the advantages of Nonpareil HD by testing it on some of your hard-worked Diesels. A Standard Oil Lubrication Engineer will be glad to help you make such a test.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

Cause of Engine Deposits. Most troublesome engine deposits are caused by: (1) fuel soot that originates in the combustion chamber, and dust that enters the engine; and (2) oil deterioration products caused by excessive heat and agitation of the oil in the presence of oxygen. Both types of contaminants tend to accumulate rapidly under heavy-duty railroad service.

Why deposits occur in conventional oil



Fuel soot and dirt

Oil oxidation products

The first diagram shows how these typical contaminants are theoretically present in a used conventional oil. They have a tendency to adhere to each other and settle out of the oil, depositing on engine surfaces such as crankcases, pistons, oil screens, oil lines, and bearings.

An oxidation-inhibited oil gives only

partial protection

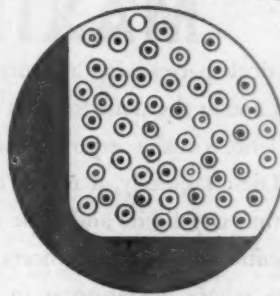


The second diagram shows how oils appear with improved oxidation stability *only*. Oxidized oil particles are materially reduced. As a result, deposits are less heavy on engine surfaces. However, this does not prevent dust, fuel soot, and the remaining oxidation products from depositing in the engine.

remaining oxidation products from depositing in the engine.

Effect of an oxidation inhibitor plus a

detergent in Nonpareil HD



In order to render harmless *all* potential deposit-forming contaminants, Nonpareil HD contains a combination oxidation inhibitor and detergent additive. The third diagram illustrates how the detergent theoretically surrounds all of

the contaminants in the oil, including the small amount of oxidized oil present, with a film which prevents them from adhering to each other or to interior engine surface. It holds them in suspension in the oil until they are removed by filtering or draining, thereby eliminating troublesome deposits. A true heavy-duty oil has both detergency and oxidation stability.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA)

STANDARD
SERVICE

EXHAUST MANIFOLD AND *SILENCER* IN ONE UNIT



MAXIM exhaust manifold silencers provide an extremely practical space saving advantage because they replace the conventional exhaust manifold and at the same time act as effective silencers of Diesel exhaust noise.

Maxim Silencers make it possible for switching and main line locomotives to use powerful Diesels quietly, a major consideration when yards and right of way are located within city limits and close to business or residential sections.

The conventional Maxim Silencers are also in wide use, often with the spark arrestor feature where operation is in a fire hazard area, such as in the case of refineries or ordnance plants.

Maxim also makes Heat Recovery Silencers, combining effective silencing and spark arresting, where necessary, with the production of hot water or steam for heating. Bulletin WH-101 describing Heat Recovery Silencers will be sent on request.



MAXIM

THE MAXIM SILENCER CO. • 65 HOMESTEAD AVE., HARTFORD, CONN.

YOUR BOILER "HOUSEKEEPING" IS EASIER WITH APEXIOR NUMBER 1



**APEXIOR NUMBER 1
KEEPS METAL SUR-
FACES CLEAN LONGER
... MAKES MAINTENANCE EASIER ...
RETARDS WEAR**

Your first experience with APEXIOR NUMBER 1 on locomotive and stationary boiler shells and other steam-and-water contacting surfaces is a satisfying discovery. Dirt and scale lose their clinging power and come off easily. There is no chemical bonding of scale to metal. Cleaning time is reduced and the work is lighter. Under the surfacing, a few thousandths of an inch thick, the metal is clean and *sound*.

Many years of service experience, on thousands of locomotives subject to Interstate Commerce Commission inspection, show that brush-applied APEXIOR NUMBER 1 coatings penetrate the pores and joints preventing acceleration of stress corrosion or embrittlement due to water contact. APEXIOR NUMBER 1 is recommended by all boiler insurance companies in the United States and Canada.

APEXIOR NUMBER 1 HELPS FEEDWATER TREATMENT

APEXIOR NUMBER 1 is neutral to all standard feed-water chemical treatments and preparations and acts as a supplement to the work of the chemist or water service engineer. It remains stable under boiler water and steam temperatures and pressures.

FOR COLD WATER STORAGE

APEXIOR NUMBER 3 protects the water-side of tender cisterns and water storage tanks. It is brush-applied and dries to a jet-black, smooth, shiny surface. It is inert to all boiler-water-treating chemicals and to potable water.

YOU CAN GET APEXIOR

Both APEXIOR surfacing materials are being manufactured in increased quantities to meet the growing demands of industrial power plants, utilities, marine users and railroads throughout the country. Shipments are made every day. Write today for your copy of a bulletin telling how APEXIOR can save metal, time and money for you.

APEXIOR

Keeps new metal new . . . Gives old metal new life

This locomotive boiler shell interior will still look new at shopping time. It's APEXIORIZED

THE DAMPNEY COMPANY OF AMERICA HYDE PARK, BOSTON 36 MASSACHUSETTS

ATLANTA NEW YORK PHILADELPHIA CHICAGO DETROIT


NOW, WHEN EVERY TON OF CARRYING CAPACITY COUNTS . . .

Deadweight reduction makes



U·S·S
High Strength
Steels

UNITED STATES STEEL



extra
available 51 freight trains!

... THAT CARRY 135,234 TONS OF FREIGHT

... THAT COST NOTHING EXTRA TO HAUL

... THEY'RE THE BONUS CAPACITY OF 51,023
LIGHTWEIGHT CARS BUILT OF U-S-S COR-TEN

IN these COR-TEN cars, lightweight construction has trimmed off from 2 to 5 tons of unnecessary dead weight. Each of these lighter cars can carry an average of 2.65 tons more payload. The grand total of 135,234 bonus tons of carrying capacity thus made available, has put at the disposal of the railroads the equivalent of 2,704 extra 50-ton cars—equal to 51 average trains—from which the revenue is all clear profit!

Today, with car loadings the highest on record, the railroads are able to utilize more fully this additional capacity made available by lighter COR-TEN construction.

COR-TEN lightweight freight equipment has stood the tough test of wartime operation with flying colors. These cars, put into service since 1935, are still in use. All of them have carried heavy loads and made high mileage without failure. They have effected operating economies that are impossible with conventional equipment.

Today U-S-S COR-TEN—the pioneer low-alloy, high-strength steel—is again available to build your new equipment light, without loss of stamina, and at little increase in cost. If you need convincing proof of the economic advantages of lighter freight car construction, let us send you data on the experience of owners of COR-TEN equipment whose operating conditions most closely approach your own.

AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago and New York
CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago
COLUMBIA STEEL COMPANY, San Francisco
NATIONAL TUBE COMPANY, Pittsburgh
TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham
United States Steel Supply Company, Chicago, Warehouse Distributors
United States Steel Export Company, New York



"THE ROCKET"



"CITY OF
SAN FRANCISCO"



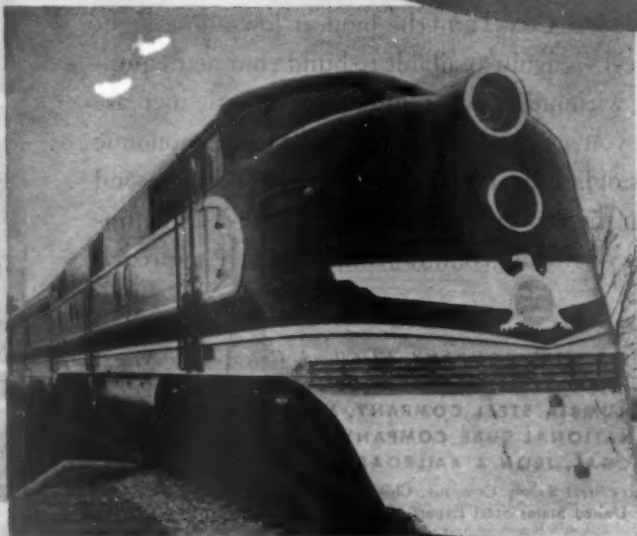
KNOWN by the COMPANY they KEEP

Products, like persons, are readily known by the company they keep. Sinclair Lubricants are in the best of company—on crack trains of America's leading railroads.

SINCLAIR RAILROAD LUBRICANTS

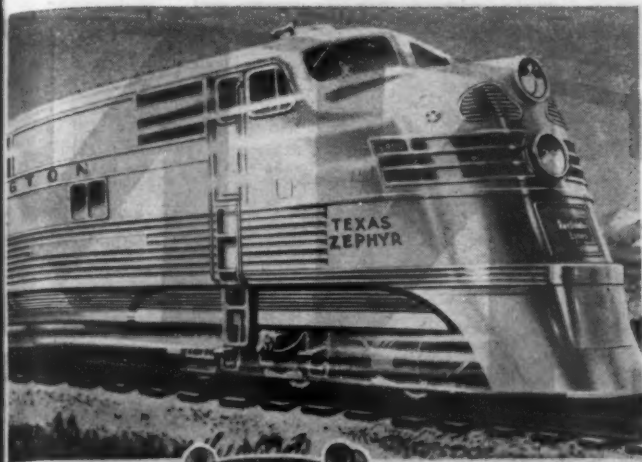
SINCLAIR REFINING COMPANY, RAILWAY SALES
NEW YORK • CHICAGO • SAINT LOUIS • HOUSTON

"MISSOURI
RIVER EAGLE"



"SILVER
METEOR"





"TEXAS ZEPHYR"



"THE CHIEF"



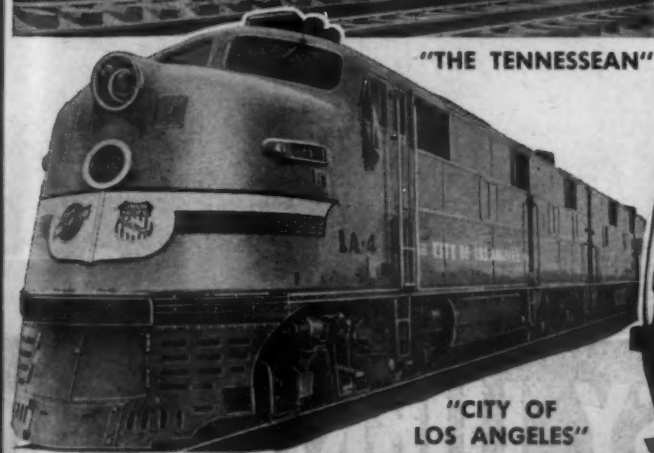
"THE CHAMPION"



"THE TENNESSEAN"



"THE HIAWATHA"



"CITY OF
LOS ANGELES"

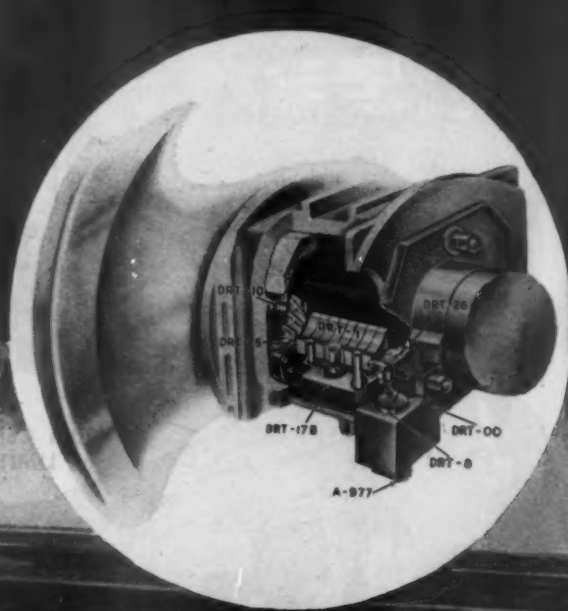


"20th CENTURY
LIMITED"

USED BY MORE THAN 150 AMERICAN RAILROADS

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OIL LUBRICATED DRIVING JOURNAL PERFORMANCE



HENNESSY LUBRICATOR

HENNESSY

A group of 19 of these engines, fully equipped with Hennessy Mechanical Lubricators on lead truck, driver, trailer and tender journals, is making outstanding records in fast freight service. Some of these locomotives have made in excess of 300,000 miles without having any repairs made to driving boxes or journals.

Performance of this kind is very exceptional and savings resulting are certainly worth while.



R CO., Inc.

75 WEST STREET
NEW YORK 6, N. Y.

MORE THAN TWO MILLION

"Zephyr" Miles

**OF WHEEL SLIDE PROTECTION WITH
AMERICAN BRAKE SHOE
CONTROLLERS**



BRAKE SHOE AND CASTINGS DIVISION



*A*merican Brake Shoe Controllers have been protecting the Burlington's famous "Twin City Zephyrs" against slid flats for more than two million train

miles. In service between Chicago and St. Paul-Minneapolis, both Zephyrs have been completely equipped since 1941 with American Brake Shoe Controllers—an important reason for the availability record of this equipment. The American Brake Shoe Controller detects wheel slippage, instantly corrects it, and restores full brake as soon as slippage is eliminated. It may be accurately tested when train is moving or standing.

AMERICAN

Brake Shoe

COMPANY

230 PARK AVENUE, NEW YORK 17, N. Y.

GOOD MOTIVE POWER **DESERVES** *Good Lagging*



and...

Good Lagging means

JOHNS-MANVILLE 85% MAGNESIA!

Because it is highly efficient... and because it *stays that way in service*... more J-M 85% Magnesia is used for locomotive boiler lagging today than any other type of insulation.

For complete information, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.



Johns-Manville

87 YEARS OF SERVICE TO TRANSPORTATION

This Highly Mechanized Bronze Foundry is turning out

Extra Miles

for planes-trains-ships



Because of this department—aircraft engines have longer efficient life—overworked, overloaded locomotives have increased availability—marine auxiliaries deliver several times the service.

WHY

Because this highly mechanized foundry, with all modern equipment from molding machines to induction furnaces, permits *quantity* production on a *quality* basis. The better bronze castings produced mean longer-lasting aircraft sealing rings for aircraft engines . . . longer-lasting main cylinder packing for locomotives . . . longer-lasting bronze-iron rings for marine auxiliaries.

The new things learned, the new facilities added, and the new methods developed all mean that this organization will be better than ever equipped to give you better peacetime Piston Rings In Every Size—Of Every Type—For Every Purpose.

KOPPERS COMPANY, INC.
AMERICAN HAMMERED PISTON RING DIVISION
Baltimore 3, Maryland

KOPPERS

THE INDUSTRY THAT SERVES ALL INDUSTRY



Four stars awarded
for excellence
in war production

Buy More War Bonds—
and Keep Them!

FOR TOMORROW—count on those who are doing the tough job today

TUBE SPECIAL DELIVERY



...TO MEET WARTIME EMERGENCIES

With steam power equipment everywhere being worked to limits of capacity these days, emergency calls for pressure tubing have been more numerous and urgent than in normal times. The war can't wait—neither can war-essential boilers and heat transfer equipment on land, sea and rails. Even the best of tubes sometimes have to be replaced more often nowadays due to prolonged, round-the-clock operation under extreme conditions.

As a leading tube manufacturer, B&W is called upon to supply many of these emergency replacements on short notice. A few examples cited here typify the urgency of such calls and how B&W was able to speed deliveries.

The reasons that enable B&W to meet these war-urgent emergencies are good reasons why you should specify B&W tubing for present and post-war needs for both welded and seamless pressure tubing. Consult B&W today.

Example 1—A troopship ready for convoy needed 13 tons of seamless boiler tubes... 926 pieces of complicated design were rolled, bent and delivered by B&W in 4 days.

Example 2—Facing a shut-down, a municipal power plant phoned for 12-4" x .203" x 18' boiler tubes... two hours later, tubes were en route by railway express.

Example 3—A west coast shipyard phoned for six stud tubes for B&W header-type boiler... within 24 hours tubes were on a night plane and installed the following day.

Example 4—A phenol plant faced a bottleneck for lack of 5,220 lb. of stainless steel tubes... the required 16' and 18' lengths of B&W tubes were flown 600 miles by the Air Transport Command.

B&W TUBES

SEAMLESS. Complete range of carbon alloys and stainless steels

Sizes: 1/2 in. to 8 3/4 in. O.D.

ELECTRIC-Resistance Welded Carbon grades.

Sizes: 3/4 in. to 4 in. O.D.

THE BABCOCK & WILCOX TUBE COMPANY

Seamless Tube Division
Beaver Falls, Pa.

Welded Tube Division
Alliance, Ohio

*Rollers
Roll*



AND THERE'S SPEED WITH SAFETY

If past performance is to be your guide in the selection of new equipment, you will find in the records an amazing history of serviceability on the part of Hyatt Roller Bearing Journal Boxes.

Not only during the extreme wartime demands on American transportation but throughout the whole past decade Hyatt Roller Bearing Journal Boxes on the cars and Diesel locomotives of streamliners have contributed to smoother starts, comfortable riding and safety at sustained high speed ... always with a minimum of maintenance.

Hyatt engineers will gladly work with your designers to meet the increased peacetime transportation needs of the future. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARING

**RAILROAD
JOURNAL BOXES**

WALWORTH VALVES and FITTINGS

for all major services
in principal industries



WHATEVER your piping need may be, Walworth manufactures the valve or fitting that will meet your specific requirements. Walworth has continuously manufactured valves and fittings since 1842. Its complete line of products includes all standard types of valves and fittings in a wide range of styles, sizes, and materials. For a detailed description of Walworth products, write on your company letterhead for a free copy of Walworth Catalog 42.



WALWORTH
valves AND fittings

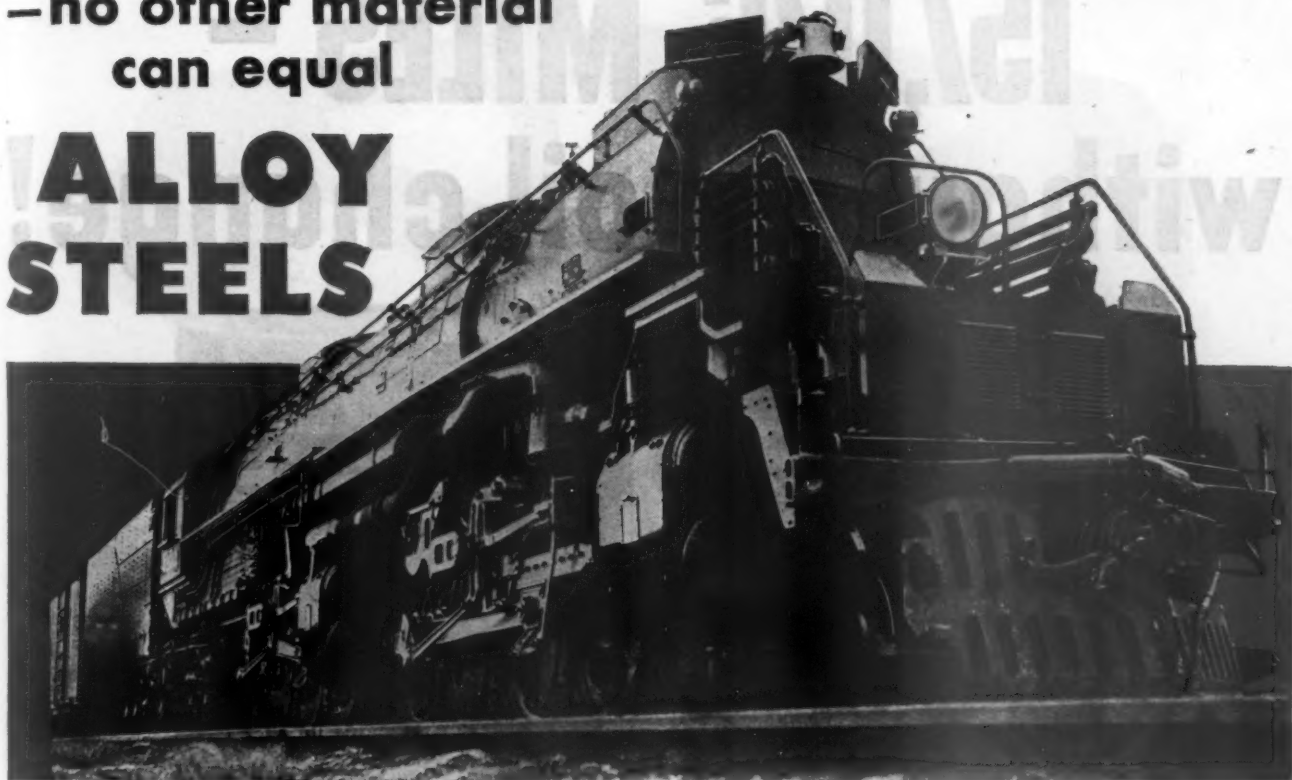
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DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

FOR REDUCTION IN WEIGHT *with Safety*

—no other material
can equal

**ALLOY
STEELS**



When reduction in cross-section of locomotive working parts is indicated to save weight or to improve performance, the safe answer is alloy steels.

These fine steels have the highest strength values of all materials. They also provide the maximum strength per pound of material involved.

And that isn't all. They rank at the top in toughness. They have the ability to resist severe shocks and concentration or reversal of stresses. And they retain their high strength over long periods of time—thus resisting the attack of fatigue.

Alloy steels are unequalled in their uniform and predetermined response to hardening treatments—providing any depth of hardness desired and

insuring against soft spots in wearing surfaces.

Alloy steels resist both sub-zero cold and red-hot temperatures. They insure against embrittlement and failure due to conditions of extreme cold. They also can be used successfully where they must operate while extremely hot.

If you want to reduce weight or area of working parts—to insure safety—to lengthen life of service—and to cut maintenance costs—ask Republic, world's foremost producer of alloy steels, what these fine steels can do for you.

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio

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Export Department: Chrysler Building, New York 17, N.Y.



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ALLOY STEELS

Also Carbon and Stainless Steels—Sheets—Plates—Pipes—Open Rails, Hots and Blasts—Electricity Boiler Tubes

THESE PISTONS WENT 157,076 MILES - without an oil change!



Rock Island "Rocket" Test Proves Superiority of RPM DELO Oil

With RPM DELO Diesel Engine Lubricating Oil in the crankcase, customary oil changes were forgotten, make-up oil added only as required. At the end of the trial RPM DELO Oil had proved its superiority. Special inhibiting, detergent and peptizing properties of RPM DELO Oil reduce wear, lower oil consumption and cost, eliminate hard or abrasive carbon, keep rings free, ports unclogged, and entire engine assembly cleaner.

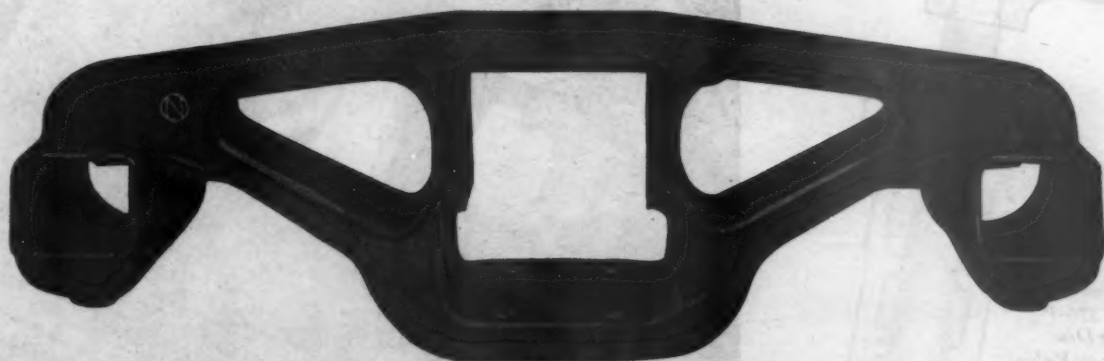
RPM DELO Oil will give you greater engine availability, too. Get full information from your RPM DELO Oil Distributor, or write for details.



Write on your letterhead for free booklet on RPM DELO Oil to Standard of California, Dept. R-1, 225 Bush St., San Francisco 20, Calif., or California Commercial Co., 30 Rockefeller Plaza, New York 20, N. Y.

STANDARD OF CALIFORNIA

NATIONAL Side Frames For Replacement



NATIONAL Side Frames

made to the latest A.A.R.
Specifications . . . Provide
greater safety and reduce
maintenance expense at
No Additional Cost.



Separate brake beam supports are
not required when side frames are
furnished with National Safety
Brake Beam Supports cast integral.

Journal Box Water Ledge —
Keeps out water and dirt and
reduces number of hot boxes.



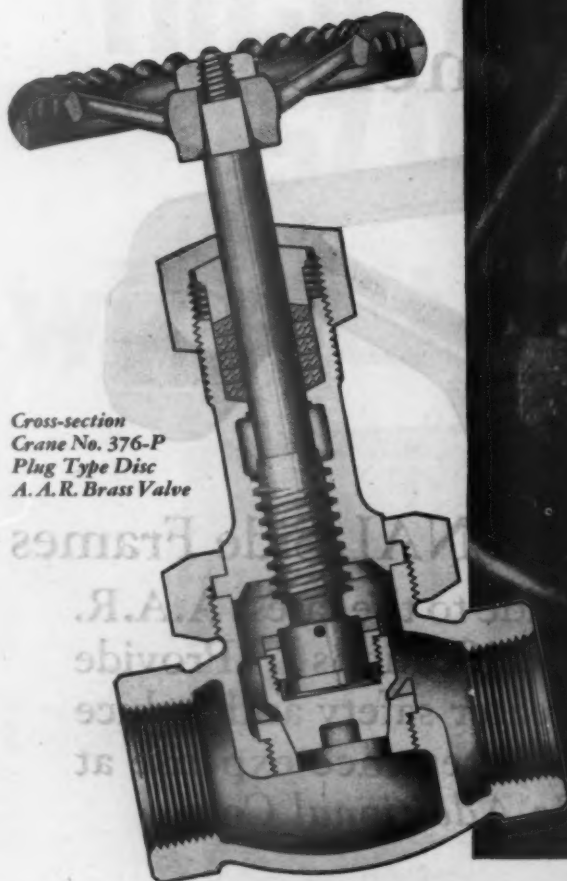
Specify National A. A. R. Side Frames For Replacement

NATIONAL MALLEABLE AND STEEL CASTINGS CO.

General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco.

Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.



Cross-section
Crane No. 376-P
Plug Type Disc
A.A.R. Brass Valve



One Source of Supply For Your A.A.R. Valves and Fittings



**For Railroads—
A truly complete
piping materials
service**

In addition to A.A.R. lines, Crane serves the railroads with the world's most complete selection of valves, fittings, pipe, piping specialties and fabricated piping—in Brass, Iron, and Steel—for all applications in shops, power houses, service buildings, stations, and on rolling stock. Consult your Crane Catalog—or Crane Branch or Wholesaler.

Consider the advantages one source of supply makes possible—how it simplifies ordering, keeping of parts stocks, and speeds maintenance work. Look at the benefits of single responsibility for your A.A.R. valves and fittings.

UNDIVIDED RESPONSIBILITY

Choose from Crane lines of A.A.R. brass globe and angle valves—with plug or ball type disc—inside screw or OS&Y—with male or female inlet, plain or union outlet. In A.A.R. malleable iron fittings, unions, and union fittings, Crane makes all patterns and sizes; including unions and union fittings with steel tailpiece. A.A.R. forged steel ground joint unions—female and reducing air pump types—are also made by Crane.

ONE STANDARD OF QUALITY

There's no stronger assurance than the Crane name on A.A.R. valves and fittings—of absolute adherence to specifications—of like dependability in every item so marked. It's the mark of quality—guarded by 90 years of quality manufacturing experience.

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. • Branches and Wholesalers Serving All Industrial Areas

CRANE



**VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS**



HONEYWELL SHUTTER CONTROL SYSTEM

*Keeps Diesel Locomotives at
Top Efficiency!*

Meeting a tough schedule demands an engine operating at top efficiency, *continuously*. An interesting example is the Great Northern Railway's operation between St. Paul and Duluth, Minnesota. The railway's diesel locomotive No. 250 makes one and a half round trips daily in passenger and freight service, running a total of 480 miles. On one of the passenger operations this locomotive runs 160 miles in four hours and makes 24 stops! Contributing to the peak operating efficiency of this locomotive is the recently installed Minneapolis-Honeywell shutter control

system which automatically holds engine cooling water at the required degree. Tests have shown that operating costs are lower, maintenance expense is cut and the engine is more responsive to the throttle when engine temperatures are constant. These advantages are being demonstrated by installations operating under extreme climatic conditions in all parts of the country. To get specific information about what the Honeywell shutter control system can accomplish for you, write Minneapolis-Honeywell Regulator Co., 435 East Erie St., Chicago 11, Illinois.

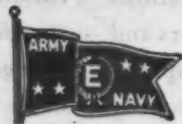
MINNEAPOLIS
Honeywell
CONTROL SYSTEMS

Keep Them Winning—
Buy MORE War Bonds!

**Molybdenum steel engine bolts
are specified because they have
proved economical in first cost
and in service.**



**CLIMAX FURNISHES AUTHORITATIVE ENGINEERING
DATA ON MOLYBDENUM APPLICATIONS.**



**MOLYBDIC OXIDE, BRIQUETTED OR CANNED •
FERROMOLYBDENUM • "CALCIUM MOLYBDATE"**

Climax Molybdenum Company
500 Fifth Avenue • New York City

*It's what goes on **INSIDE** that counts*



Inside an engine, Pedrick craftsmanship produces results

ALL THE THINGS that go to make up fine ring performance are properly blended into Pedrick rings. Long years of production experience in developing means of holding tolerances and tensions . . . constant field checking to be sure of results . . . advance designing to keep abreast of modern developments—all these are part of the Pedrick recipe that enables Pedrick craftsmen to produce outstanding rings.

Heat-Shaping is a typical Pedrick development that sets exactly the right amount of tension in a ring,

properly distributed around its entire circumference. This exclusive process removes the stresses and strains of machining operations and greatly contributes to the long-life efficiency of the ring.

If you have a taste for economical, longer-lasting service for Diesel engines, pumps, compressors, or air-operated equipment, recondition with Pedrick Rings.

WILKENING MANUFACTURING Co., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co. (Canada), Ltd., Toronto.

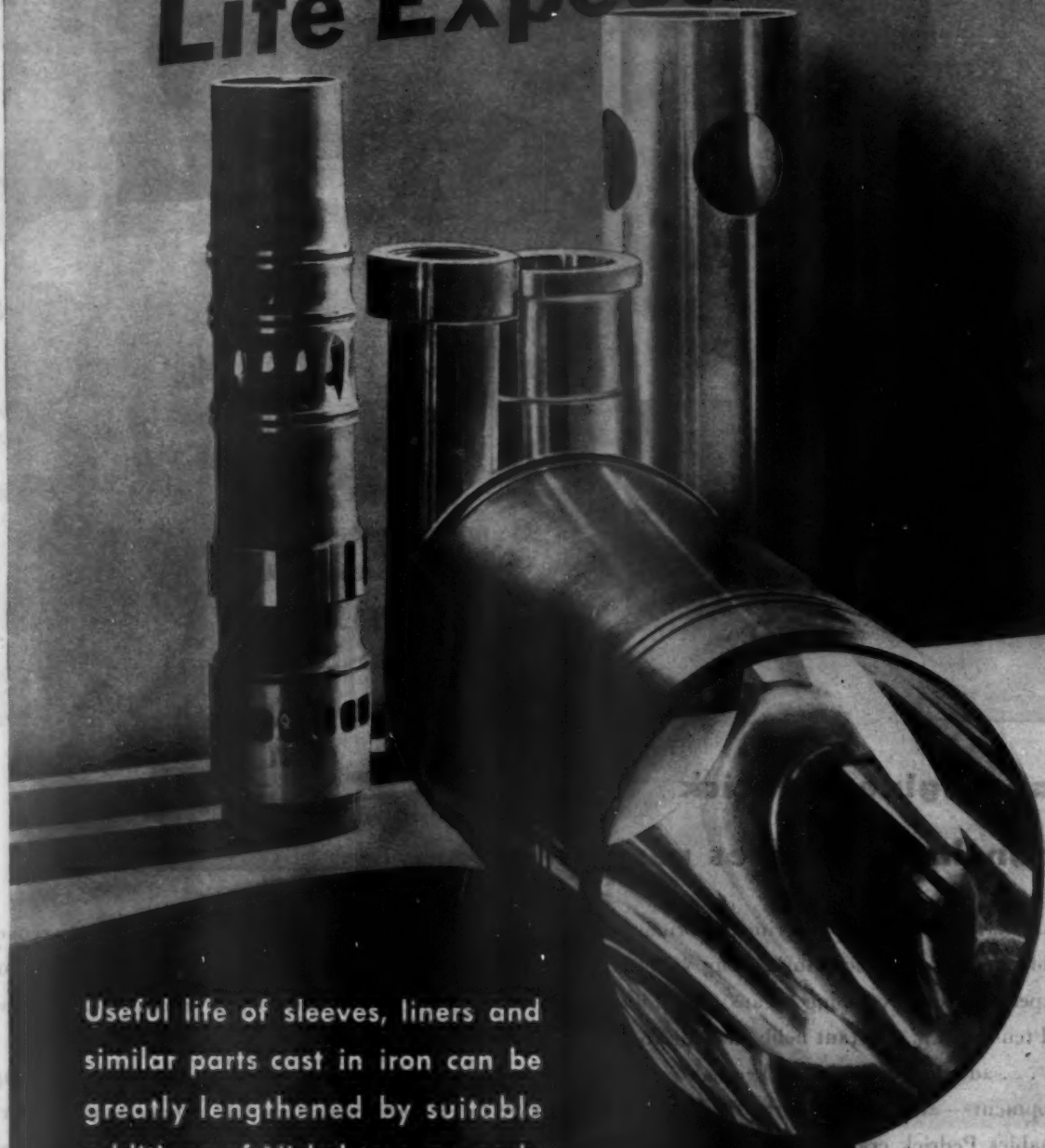
Pedrick

precisioneered **PISTON RINGS**

FOR THE PRESENT, BUY MORE
BONDS FOR YOUR FUTURE

NICKEL increases their

Life Expectancy ...



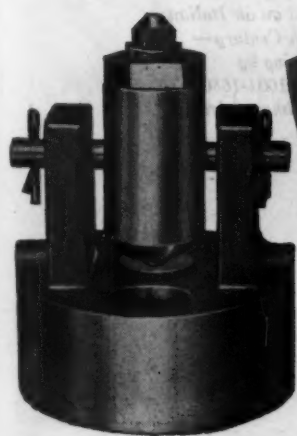
Useful life of sleeves, liners and similar parts cast in iron can be greatly lengthened by suitable additions of Nickel to a properly adjusted base mixture. Counsel and data to help you in the selection, fabrication and heat treatment of ferrous and non-ferrous metals is available upon request.

**NICKEL
Cast Iron**

**THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N.Y.**

DIESEL BEARINGS *Do Last Longer*

AND LESS FREQUENT INSPECTIONS ARE NECESSARY



WHEN
PREVENTIVE
MAINTENANCE
STARTS HERE

Maximum bearing wear and less frequent bearing inspections are only two of the many important advantages of the Bearing Watchdog System. By installing this crankshaft protection device, wear beyond predetermined standards, or shell-out of connecting-rod and main bearings on your Diesels can be detected in plenty of time to prevent damage to the crankshaft. Any bearing failure, broken connecting-rod or connecting-rod cap or cap bolt will actuate the trip lever resulting in engine shut-down within a few seconds. System operates by compressed air from the main reservoir, through the Serv-O-Motor of any standard hydraulic governor. No electrical circuits or fluids enter the crankcase.

The Bearing Watchdog System has been thoroughly tested and proved on leading railroads. It offers inexpensive insurance against expensive crankshaft repairs and replacements and the loss of many hours operating time for your Diesels. Write today for detailed information.

- CUTS DIESEL MAINTENANCE COSTS
- PROTECTS THE CRANKSHAFT
- PERMITS MAXIMUM BEARING WEAR
- FREQUENT BEARING INSPECTIONS UNNECESSARY
- LOCATES FAULTY BEARING INSTANTLY
- SIMPLE . . . POSITIVE . . . LOW MAINTENANCE
- PNEUMATICALLY OPERATED
- PROTECTS THE ENGINE

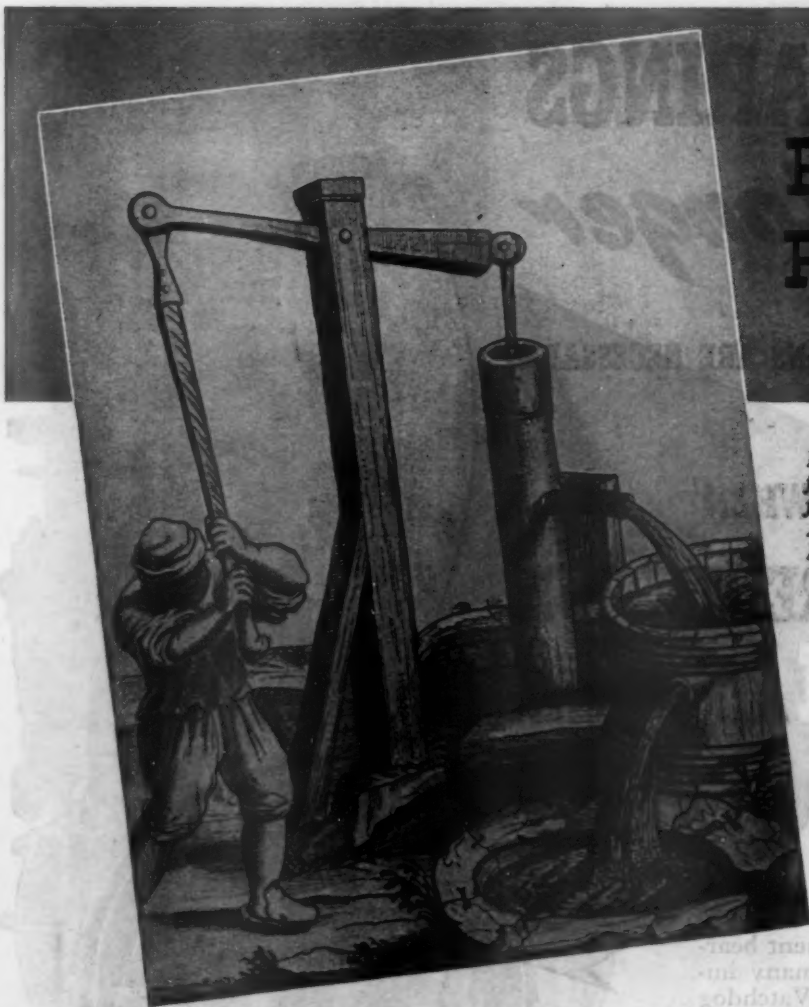
We invite inquiries from Diesel Designing Engineers, Diesel Engine Manufacturers and Diesel Operators.

INSTALL THE
**BEARING WATCHDOG
SYSTEM**
in your Diesels

paxton
DIESEL ENGINEERING COMPANY

2614 Martha Street
Omaha 5, Nebraska

DIESEL SPECIALTIES ★ PARTS ★ REPAIR SERVICE
A Subsidiary of PAXTON-MITCHELL COMPANY
Manufacturers of P-M Metallic Rod Packing



PRIMITIVE PUMP—1650

*Primitive pump used on an Italian farm during the 17th Century—
from a copper engraving by
Athanasius Kircher, 1601-1680.
Illustration from Bettmann Archive.*

That's One Way To Pump Water



GARLOCK LATTICE-BRAID PACKING

The unique structural design imparts semi-automatic pressure action. Available in several styles for service on pumps and other equipment.

**THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK**

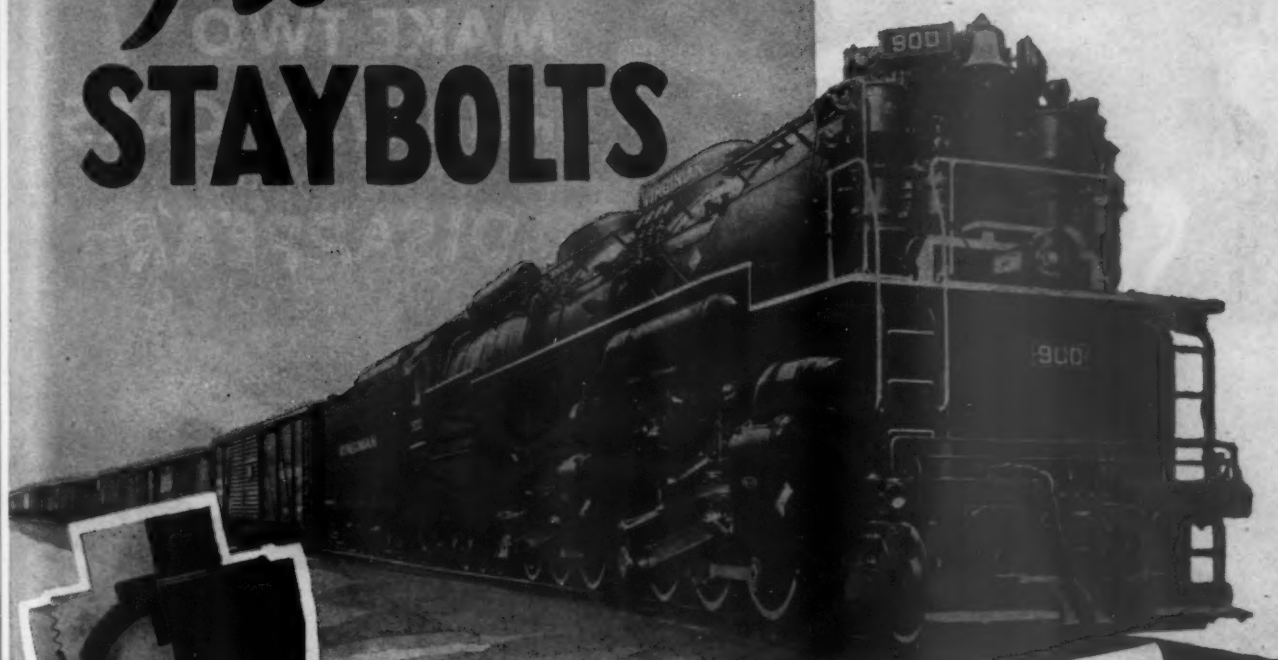
In Canada: The Garlock Packing Company
of Canada, Ltd., Montreal, Que.



The lift pump used by the farmers in Europe some four hundred years ago seemed to do a fairly good job according to this old-time illustration. But it's a far cry from the modern high-pressure and high-speed pumps in use today. Pump valves, packings, gaskets and oil seals have also improved through the years—keeping pace with engineering advancements in the equipment in which they are used. Today the complete line of Garlock products fills every need of modern industry.

Garlock

HOLLOW *Flexible* STAYBOLTS



FOR NEW RECORDS
FROM YOUR STEAM POWER
IN THE POST-WAR ERA

FLANNERY BOLT COMPANY

BRIDGEVILLE



PENNSYLVANIA

LADIES AND GENTLEMEN:

I WILL NOW MAKE TWO RAILWAY CARS DISAPPEAR



● This trick isn't done with mirrors.

It's the power parasites that do it...

They draw on the locomotive, directly or indirectly, as a source of power for car air-conditioning and electric services. And with that taking as much as 800 hp. away from the locomotive hauling a twelve-car train—two cars have to disappear.

Don't let power parasite systems trick you out of any revenue-producing cars. Equip your cars with Waukesha engine-driven units.

Entirely independent of locomotive, train movement, car location, or stand-by service, Waukesha engine-driven units automatically supply modern, deluxe air-conditioning and lighting on demand... Ask any user, or write to:

Refrigeration Division

WAUKESHA MOTOR COMPANY

WAUKESHA • WISCONSIN

Largest Builders of Mobile Engine-Driven Refrigeration and Generator Equipment

NO. 9 OF A SERIES ILLUSTRATING THE EVOLUTION OF AMERICAN LOCOMOTIVES



1891 — BALDWIN'S 0-10-0 TANK

When this engine was delivered by the Baldwin Works to the St. Clair Tunnel Company in 1891, it was the heaviest locomotive in the world. It was designed to haul heavy freight trains through the new tunnel under the St. Clair River between Sarnia, Ontario, and Port Huron, Michigan. This bore was 6,000 feet long with approach grades averaging 105 feet to the mile. The engine was well designed, all of its weight being available for traction. All wheels with the exception of the center pair were flanged and had brakes. Hard coal was used as fuel ... Weight 195,000 pounds. Drivers 50 inches in diameter. Total wheelbase 18 feet, 5 inches. Tractive force 58,000 pounds.

From "IRON HORSES" ... W. W. NORTON & CO., INC.

THE WORLD'S HEAVIEST LOCOMOTIVE

packed a lot of push in her time. But today's locomotives of equal tractive force are doing a much better job with ...

UNION WEB SPOKE DRIVING WHEEL CENTERS

- ★ Cruciform section spokes for great additional strength.
- ★ Reinforced rim support to eliminate flat spots, out of roundness, etc.
- ★ Correct distribution of metal for better balancing of smaller diameter wheels.
- ★ Wheels easily inspected before and after installation.
- ★ Troubles due to shrinkage eliminated by simplicity of design.
- ★ Can be made to any material specification.



UNION STEEL CASTINGS

DIVISION OF
BLAW-KNOX CO.
PITTSBURGH, PA.

FEED WATER HEATING

By Coffin

SIMPLICITY
IGNIFIES
ATISFACTORY
ERVICE



IN THE entire Coffin Feed Water Heater System there are only two moving parts. One of these is supported by ball bearings.

The absence of numerous moving parts in mechanical contact is singularly distinctive of the Coffin System. It naturally results in dependability of service and in freedom from excessive maintenance expense.

THE J. S. COFFIN, JR., COMPANY
ENGLEWOOD, NEW JERSEY



PLEASE SEND FEED WATER HEATER BULLETIN

NAME _____

COMPANY _____

ADDRESS _____



ROL-MAN

The Harder the Service the "Harder" ROL-MAN Becomes

Abrasion, impact and pressure, cold work-harden the surface of Rol-Man in direct proportion to the intensity of these forces. The greater the forces, the greater the resistance developed by Rol-Man.

Underneath its surface armor, Rol-Man retains its original tough-hardness and ductility to resist breakage. But as the armor slowly wears, the forces that caused the wear renew this armor to resist further wear. That's why Rol-Man High (11% to 14%) Manganese Steel lasts so many times longer than case-hardened carbon steel.

Use Rol-Man for Spring Rigging Connections, Bolster and Transom Wear Plates and all other parts that demand the utmost in abrasion resistance and strength on Passenger Cars and Locomotives.

Manganese Steel Forge Co., 2813 Castor Avenue, Philadelphia 34, Penna.

PINS • BUSHINGS • WEAR PLATES

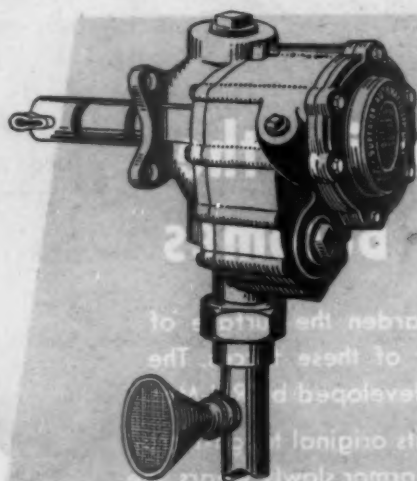
Rol-Man Pins and Bushings are ground to precision diameters. Wear Plates are fabricated to your specifications, ready for installation.

SUPERIOR 3-WAY FLUE ROLLER

**This Easier, More Practical
Method does a Better
Job and — — — — —**

The Superior 3-Way Flue Roller in one simple easily performed operation expands the tube in the sheet, forms a prosser on the water side and flares the end of the tube. Moreover, the expansion and prossering is accomplished without scoring the tube. There can be no distortion of flues, no fire-cracking in firebox end, no flying chips.

**Saves
80 per cent
in Time
and Money**



SUPERIOR *Automatic* FLUE BLOWER

With this equipment any locomotive will stay on the road longer and give better performance.

The Superior Automatic Flue Blower keeps flues and Flue Sheets clean. That means maintained steam power, longer hauls, heavier loads, less fuel consumption. It means a definite stepping-up of transportation which today is one of the biggest problems confronting the nation. Let us send you performance charts and full information.

**SUPERIOR RAILWAY PRODUCTS CORP.
7501 Thomas Boulevard, Pittsburgh, Penna.**

MAN!
that's real lighting

A trifling detail? By no means! Modern lighting is a vital part of your postwar rail travel "package". For to compete in tomorrow's travel world, rails must provide extra reliability, speed, quietness—and comfort—which means in part, an efficient source of light.

Rail designers universally accept the dependability of V-Belt Drives for power transmission to modern generators. And they depend traditionally upon Dayton Rubber the *World's Largest Manufacturer of V-Belts* for Sound Engineering in V-Belt applications.

The men of Dayton's Railway Division will be ready to serve you in the future, as in the past, with properly engineered V-Belts for your most exacting requirements.

THE DAYTON RUBBER MANUFACTURING COMPANY

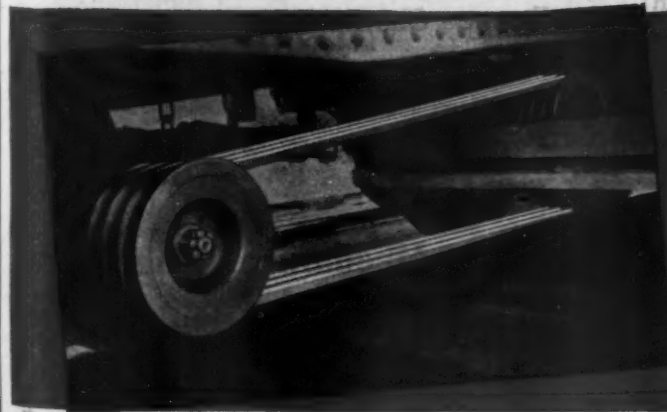
DAYTON 1, OHIO

40 years experience in both natural and synthetic rubber processing

Railroad V-Belts by

Dayton
REG. TRADE MARK THE DAYTON RUBBER MFG. CO.
Rubber

THE MARK OF TECHNICAL EXCELLENCE IN SYNTHETIC RUBBER



**IT'S UP TO YOU
TO HELP MAKE
2=3 WITH...**

A job for seasoned executives—this 7th War Loan! Especially when we've got to make 2 war loans total just about as much as all 3 in 1944! Putting this over demands the combined and *continued* efforts of the "No. 1" men of American industry.

This means marshaling your plant drive to make every payday—from now 'til June 30th—do its share toward the success of the 7th. Directing the drive is not enough. It's equally important to check to see that your directions are being carried out—intelligently!

For example, has every employee had:

- 1 an opportunity to see the new Treasury film, "Mr. and Mrs. America"?
- 2 a copy of "How To Get There," the new Finance Division booklet?
- 3 a new bond-holding envelope with explanation of its convenience?
- 4 7th War Loan posters prominently displayed in his or her department?
- 5 information on the department quota—and an urgent personal solicitation to do his or her share?



If you haven't a copy of this important booklet, "7th War Loan Company Quotas," get in touch immediately with your local War Finance Chairman.

The Treasury Department acknowledges with appreciation the publication of this message by

Railway Mechanical Engineer

★ This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council ★



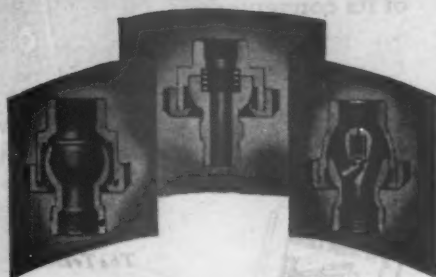
Remember, meeting—and beating—your highest-yet 7th War Loan quota is a task calling for "No. 1" executive ability. Your full cooperation is needed to make a fine showing in the 7th! Do not hesitate to ask your local War Finance Chairman for any desired aid. It will be gladly and promptly given.

Indispensable Fluid Control

THROUGH RESPONSIVE MOVEMENT



Modern industry and modern transportation alike depend on controlled circulation of vital fluids . . . oil, gases, water, steam. For these arterial systems, Barco Flexible Joints have provided necessary protection for over 30 years . . . guarding these mechanical "life-lines" against vibration and shock . . . compensating for contraction and expansion. For complete information, write to Barco Manufacturing Company, Not Inc., 1808 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.



BARCO FLEXIBLE JOINTS

THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS



Not just a swivel joint . . . but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

"MOVE IN

EVERY

DIRECTION"

WOVENSTONE

INSUTAPE

TEAM



BARCO FLEXIBLE JOINTS

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DIRECTION

EVERY

MOVE IN



IMMATES!

INSUTAPE and WOVENSTONE save fuel and eliminate maintenance problems. Their high insulating efficiency means greater passenger comfort, too.

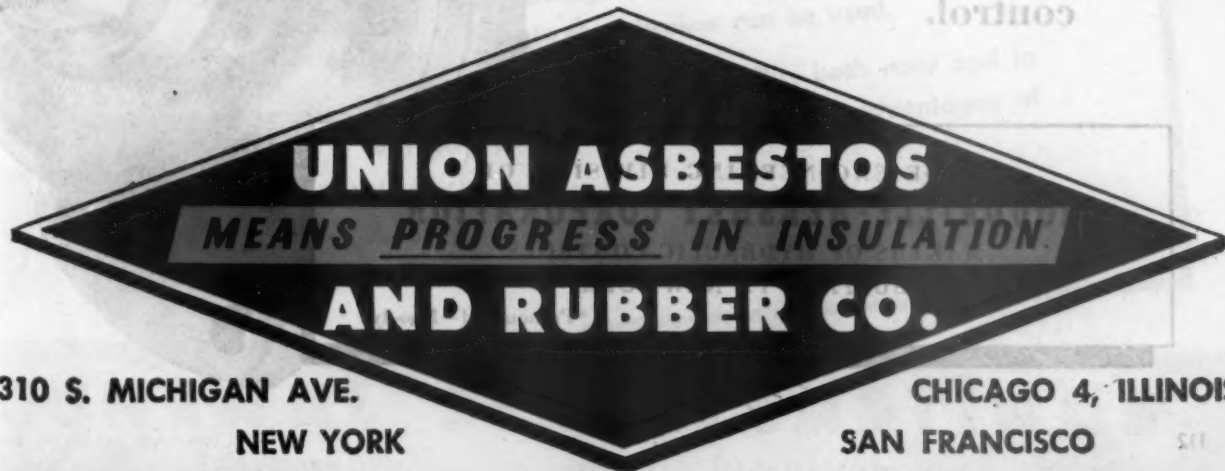
Here are the reasons:

Unarco steam-pipe insulations prevent pipes from freezing—keep steam coursing through the train at peak-efficiency; will not shake down—always remain snug and firm against the pipe—can be reapplied over and over again.

... And here's the proof:

Operating tests prove that Insutape eliminates 64% of bare pipe heat losses. Savings have been proved under still air conditions, but are much greater under wind velocity conditions found in the actual operation of rolling stock.

Wovenstone has proved its efficiency in 12 years of "active service." Many mechanical men can point with pride to rolling stock that is still equipped with its original Wovenstone—rolling stock placed in service over 12 years ago!

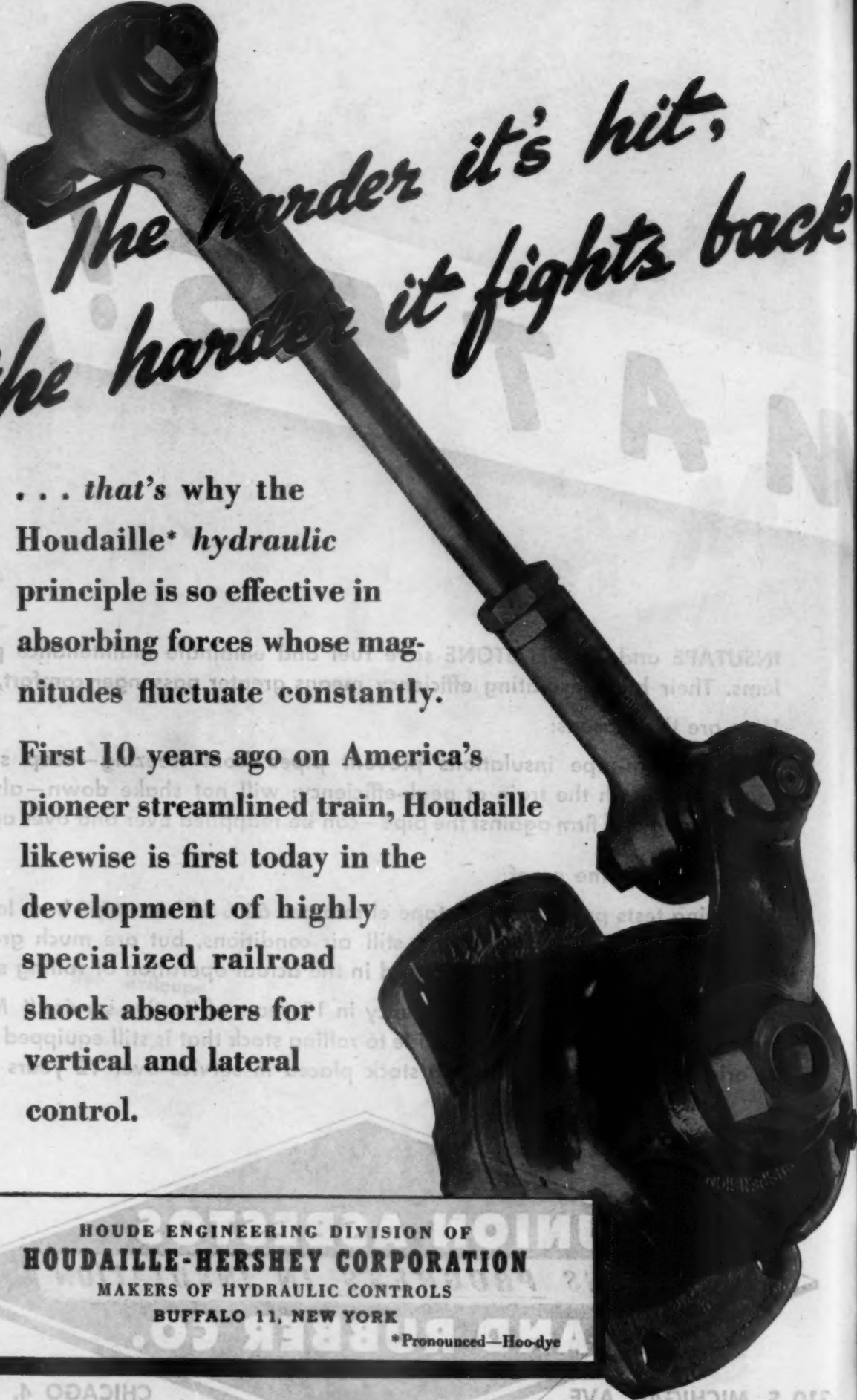


310 S. MICHIGAN AVE.

NEW YORK

CHICAGO 4, ILLINOIS

SAN FRANCISCO



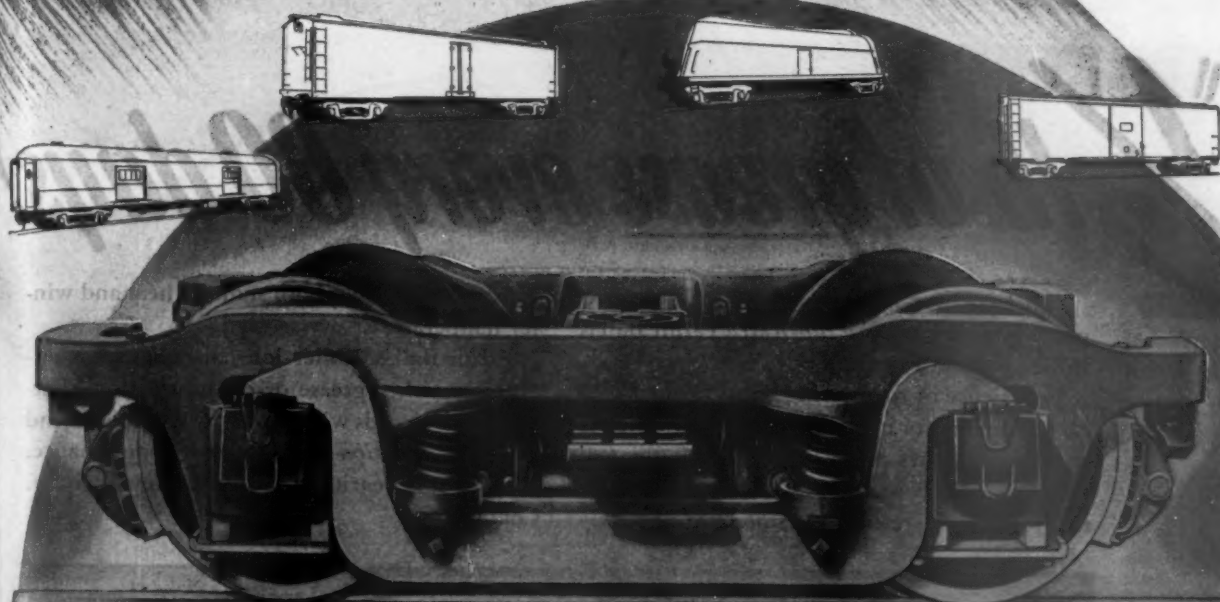
*The harder it's hit,
the harder it fights back*

... that's why the
Houdaille* hydraulic
principle is so effective in
absorbing forces whose mag-
nitudes fluctuate constantly.

First 10 years ago on America's
pioneer streamlined train, Houdaille
likewise is first today in the
development of highly
specialized railroad
shock absorbers for
vertical and lateral
control.

HOEDE ENGINEERING DIVISION OF
HOUDAILLE-HERSHEY CORPORATION
MAKERS OF HYDRAULIC CONTROLS
BUFFALO 11, NEW YORK

*Pronounced—Hoo-dye



Especially Designed for **Express, Refrigerator, or Merchandise Cars in Passenger Train Service**

THIS COMMONWEALTH EQUALIZED SWING-MOTION truck meets the demands for a safe, practical, lightweight truck for use under commodity carrying cars operating in high-speed service.

Two spring systems — full-elliptic bolster springs and equalizer coil springs — give increased spring capacity. The swing hanger arrangement permits lateral control. This COMMONWEALTH truck provides better riding which results in less shock and damage to car contents, car body, and track structure. Either clasp or single shoe brakes can be used.

With the general speeding up of merchandise traffic, both now and in the postwar era, it will pay you to investigate all the advantages of this COMMONWEALTH truck.

GENERAL STEEL CASTINGS

Eddystone, Pa.

Granite City, Ill.

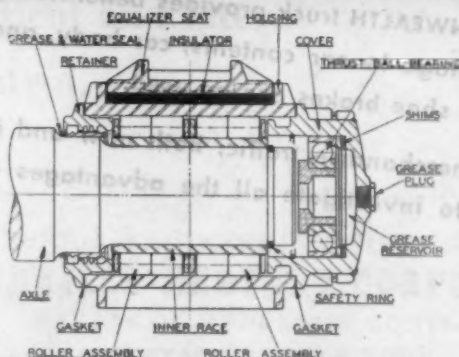
"1/2 lb. of grease every 60 days!"

You have just read the entire maintenance procedure for a *greased lubricated* Fafnir Ball & Roller Journal Bearing.

Experience of roads using these *grease lubricated* bearings for more than four years indicates that grease "stays put"; leakage is eliminated; dirt is effectively sealed *out*; maintenance is cut to the bone. Grease has "stood up" entirely

satisfactorily under both summer heat and winter temperature.

Fafnir Ball & Roller Journal Boxes are available for either grease or oil lubrication. Performance records will show why we recommend *grease lubrication* for low cost maintenance. The Fafnir Bearing Company, New Britain, Connecticut.



FAFNIRS OFFER:

HIGH CAPACITY—hardened solid steel rolls carry the load, ball bearing takes the end thrust.

POSITIVE LUBRICATION at all speeds; cool running.

EASY APPLICATION—alloy housing interchangeable with plain sleeve type in standard pedestal openings.

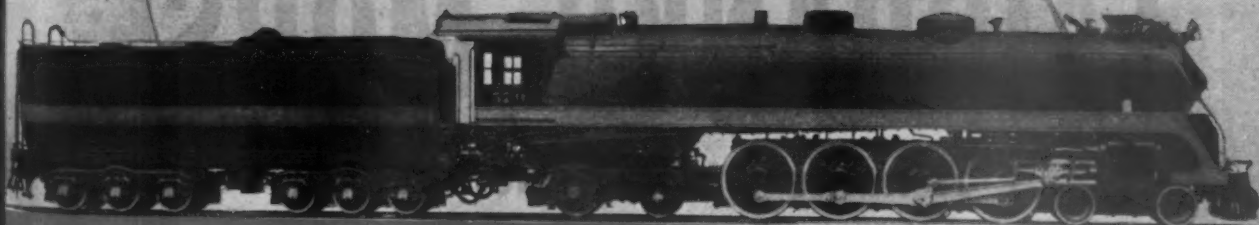
FAFNIR BALL & ROLLER JOURNAL BEARINGS
REDUCE STARTING LOADS UP TO 90% • • • CUT MAINTENANCE TWO-THIRDS

Congratulations!

**TO THE NASHVILLE, CHATTANOOGA &
ST. LOUIS RAILWAY ON THE COMPLETION
OF A CENTURY OF SERVICE**

The attainment of a hundred years of age is an important event in the life of any organization; it is, above all, proof of success—of public confidence and esteem. So to the Nashville, Chattanooga & St. Louis Railway we extend our hearty congratulations. May its trains ever keep on rolling!

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO



One of 20 Type 4-8-4 completely Timken Bearing Equipped locomotives on the N. C. & St. L. R. R. The first 10 of these engines were bought in August 1942, and this order was repeated in October 1943.

Tomorrow's
POWER
Today!



It's the Opposed-Piston Diesel Locomotive by
FAIRBANKS - MORSE
A name worth remembering

TAKE YOUR CHOICE

Dependable Protection for the Danger Zone of Brake Equipment

UNIVERSAL

Brake Beam Safety Support

- A comparatively new device that has received speedy recognition, and is justifying its use on all types of freight equipment.

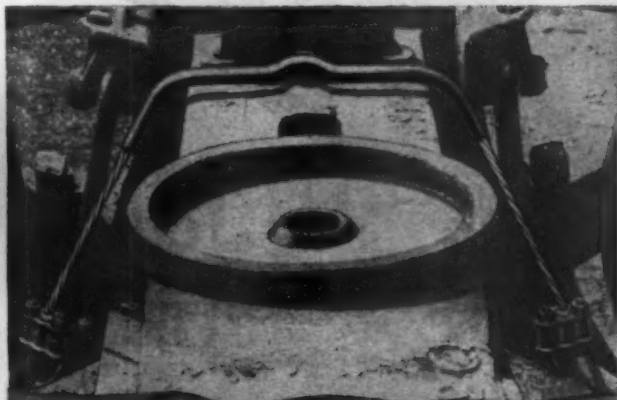
GRIPCO

Brake Beam Safety Support

- An old favorite that is functioning very satisfactorily on many thousands of cars.

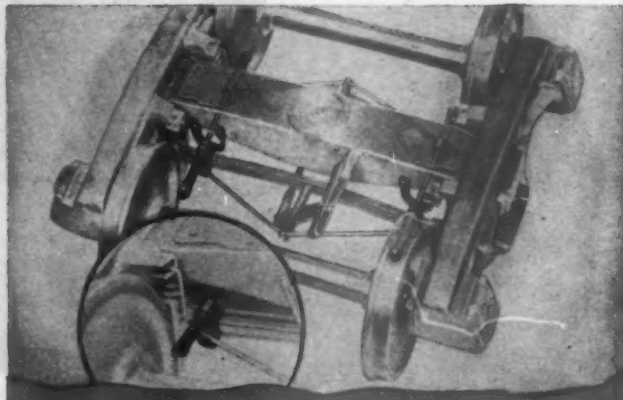
THESE SUPPORTS ARE A.A.R. APPROVED EQUIVALENT

1066



Universal BRAKE BEAM SAFETY SUPPORT

- Economical—easy to apply—adjustable—light in weight. Attached only to the Brake Beams.



GRIPCO BRAKE SAFETY BEAM SUPPORT

- Holds brake beams in horizontal position. Spring action pulls shoes away from wheel contact when brakes are released, eliminating brake shoe drag.

GRIP

NUT COMPANY

310 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

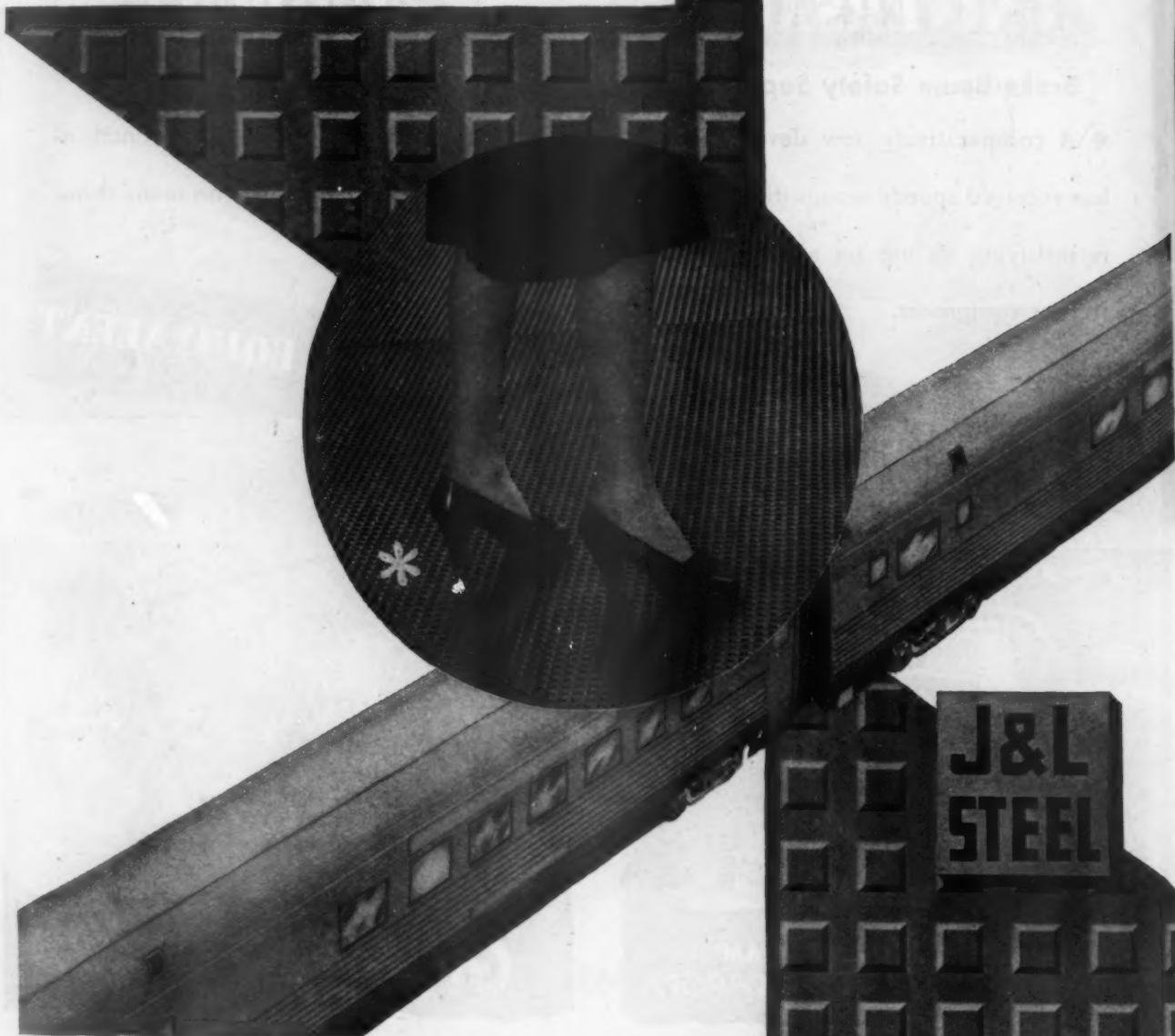
REGIONAL OFFICES: ST. PAUL — MINNEAPOLIS — ST. LOUIS — SAN FRANCISCO — CHICAGO — CLEVELAND — SALT LAKE CITY — SALISBURY, N. C. — PITTSBURGH — NEW YORK

Serving American Railroads Since 1906

JAL-TREAD

CHECKER FLOOR PLATE GUARDS SAFETY OF PASSENGER'S STEP

* Uniform support, even for small heels, affords protection against turned ankles



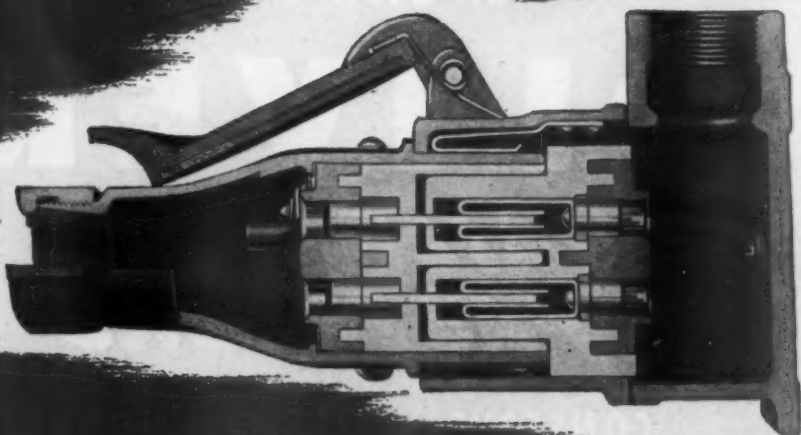
Many a slip, a fall, an injury has led to a lawsuit. Jal-Tread steps up safety in handling traffic by providing an efficient friction surface for floors, steps, vestibules, and all places where extra-safe footing is required. Jal-Tread saves weight, yet is tough and stands up under hard wear and abuse. Its real checker-board pattern offers a pleasing appearance and is easy to clean. Its straight-line pattern makes it quick and economical to install.

For delivery information, consult your nearest J&L office or regular supplier.

Illustrated booklet sent on request.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA



Section view: Note long distances from contact to contact and from contacts to ground.

QUELARC

The circuit breaking plugs and receptacles . . . ratings up to 200 amperes

Pyle-National plugs and receptacles are built to stand up in railroad service, delivering dependable service with minimum maintenance. The exclusive QuelArc construction provides exceptional protection to contacts, for safe use as current rupturing devices. In the section view, note the complete enclosure of all contacts in insulating chambers which form an arc-trapping space. Note also the long distances from contact to contact and from contacts to ground. Contacts are individually renewable. Full ground protection is provided.

QuelArc plugs and receptacles are available in a complete range of styles, 2, 3, 4 wire types; ratings 20, 30, 60, 100, and 200 amperes. Many other types

available for portable tools and control and instrument circuits. Write for general catalog 1100 with listings of all types.

THE PYLE-NATIONAL COMPANY

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HEADLIGHTS • TURBO-GENERATORS • CONDUIT FITTINGS • FLOODLIGHTS • MULTI-VENT



IN ROUNDHOUSE

or CAR SHOP

OLIVER

RAILROAD FASTENERS

CONSERVE VITAL MAN-HOURS..

AID IN DEPENDABLE, ECONOMICAL
OPERATION

The high quality, uniformity and dependability of Oliver bolts, nuts and rivets mean faster assembly, better joints. In building or repairing cars and locomotives, work goes faster when you use the proper types and sizes of accurately made, close-fitting Oliver fasteners.

Years of experience and modern equipment enable us to produce, in quantity, the types of fasteners needed for railroad service.



Write for the Oliver Railroad Catalog No. 4. Lists bolts, nuts, rivets, gage rods and other accessories.

OLIVER

IRON AND STEEL

Corporation

SOUTH TENTH & MURIEL STREETS · PITTSBURGH 3, PA.

'Safety 68'

a car lighting plastic



To
help
your
seeing

The main purpose of any artificial light is to make things easy to see. The best artificial light does this with least discomfort to the eye. "Safety 68" plastic, as used for car lighting, does it with 80 percent light transmission and with minimum eye discomfort. The surface of a lighted fluorescent lamp, although less bright than an incandescent lamp, is too bright for eye comfort. "Safety 68" plastic reduces the surface brightness by spreading it over a much larger area without losing much of the lamp's lumen output. Its low surface brightness, its pearl-white color and its high light transmission help your seeing.



To
stop
your
seeing

If a glass or plastic shade is nearly transparent so that it passes a large amount of light for illumination, it is also apt to be easy to see through. The lamp sockets and other structural parts inside the shade are visible and its appearance is not pleasing. "Safety 68" plastic has peculiar vision diffusing properties which prevent seeing through it without reducing its 80 percent light transmission. So, it stops your seeing the insides of Safety Company lighting fixtures and continuous lighting troughs extensively used in railway passenger cars, while helping you to read fine print with comfort.



THE SAFETY CAR HEATING and LIGHTING COMPANY, INC.
NEW YORK - CHICAGO - SAN FRANCISCO - PHILADELPHIA - BOSTON - ST. LOUIS - MONTREAL



PASSENGERS WILL BE MORE DISCRIMINATING!



HOT ZONE

MODERATE
ZONE

COLD ZONE



ESTABLISHED 1898

Fiberglas*

*Trademark Reg. U. S. Pat. Office by Owens-Corning Fiberglas Corp.

Keeps Them In The Comfort Zone



Here are a few of the
different forms of
Fiberglas Insulation
for railroad equipment.

Fiberglas Passenger Car Insulation
has been tested, approved and
used extensively by every major
railroad and car builder...on prac-
tically all de luxe "name trains."

Summer or winter, railroad passengers of tomorrow will demand Comfort. Whether they ride in club car, bedroom, or coach, they will expect to enjoy "the moderate zone" the year around.

Fiberglas, the insulating material of tomorrow, here today, efficiently *seals in* the manufactured comfort of air-conditioning and heating equipment and *seals out* uncomfortable weather. And it is fireproof, light weight, reduces noise. To gain these benefits, specify Fiberglas in your designs—be sure of permanent, efficient insulation year after year.

Now available to railroads and car builders. Complete information on extraordinary new developments in Fiberglas insulations sent at your request.

Fiberglas* is sold to Railroads and Car Builders exclusively by

GUSTIN-BACON MFG. COMPANY

KANSAS CITY 7, MISSOURI

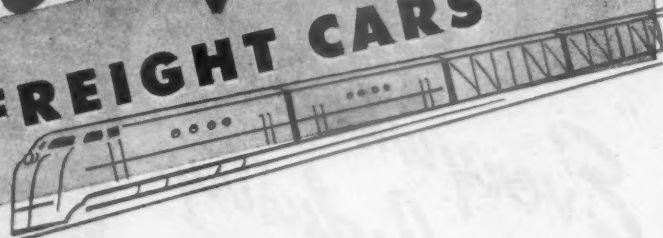
New York • Philadelphia • Chicago • Tulsa • Houston • Fort Worth • San Francisco

RAILWAY INSULATIONS MADE OF FIBERGLAS*



Higher Speeds

FOR FREIGHT CARS



Now, Monroe's new Direct-Acting Hydraulic Shock Absorber unit is accepted as an outstanding engineering development for America's freight car rehabilitation program.

Incorporating the same exclusive Monroe Airplane Type Hydraulic Shock Absorber principles that have proved their superiority over millions of railway car miles . . . it is a proved product.*

GREATER SAFETY . . . LOWER COSTS

Monroe's Direct-Acting Hydraulic Shock Absorber unit checks progressive harmonic motion . . . controls vertical and swaying action . . . protects lading, equipment and roadbed . . . reduces maintenance costs and damage claims . . . makes higher speeds safer and practicable.

It is quickly and easily installed . . . fits right in . . . replacing one of the coil springs or snubbers in the spring cluster.

Our engineers will gladly work with you in the application of this modern new Monroe Direct-Acting Hydraulic Shock Absorber for the rehabilitation of your freight cars.



RAILWAY SUPPLY DIVISION

MONROE

MONROE AUTO EQUIPMENT CO., MONROE, MICH.



In use since 1938 on high speed crack streamliners, Monroe Airplane Type Hydraulic Shock Absorbers have smoothed the ride and saved thousands of man hours' maintenance time. They demonstrate the soundness of exclusive Monroe Hydraulic Shock Absorber principles.

"Everywhere in Industry" and that includes RAILROADING!

HERE is part of a page from Hycar's new booklet "Everywhere in Industry". It lists applications for Hycar synthetic rubbers in a variety of industries. But of greatest importance to you, it lists 21 specific suggestions where products made from Hycar can be used to advantage in the railroad industry.

These products are suggested because their use can mean increased efficiency and reduced operating costs. For example, hose made from Hycar lasts longer, needs less maintenance, and so means lower overall cost.

Hycar's many valuable inherent properties are shown in the box at the right. Examine this list, keeping in mind the requirements of your rubber parts. Remember that it's possible to select exactly the right combination of properties to meet your established service conditions.

Ask your supplier for parts made from Hycar for test in your own applications—difficult or routine. For your FREE copy of "Everywhere in Industry", which describes Hycar's characteristics, with full technical data, write Department P-3, Hycar Chemical Company, Akron 8, Ohio.

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubbers

SUGGESTED USES—EVERYWHERE IN INDUSTRY

| APPLICATION | Automotive | Aviation | Petroleum | Machinery | Chemical | Textile | Printing | Marine | Railway | General |
|--------------------------------|------------|----------|-----------|-----------|----------|---------|----------|--------|---------|---------|
| Hose, steam and water | x | x | x | x | x | x | | x | x | x |
| Hose, oil and gasoline | x | x | x | x | x | | | x | x | x |
| Hose, coolant | x | x | x | x | x | x | x | x | x | x |
| Hose, hydraulic fluid | x | x | x | x | x | x | x | x | x | x |
| Gaskets, packings, seals | x | x | x | x | x | x | x | x | x | x |
| Diaphragms—Valve and regulator | x | x | x | x | x | x | x | x | x | x |
| Mountings and Bushings | x | x | x | x | x | x | x | x | x | x |
| Vibration dampening equipment | x | x | x | x | x | x | x | x | x | x |
| Line supports and grommets | x | x | x | x | x | x | x | x | x | x |
| Brake expanders and liners | x | x | x | x | x | x | x | x | x | x |
| Conveyor Belts | x | x | x | x | x | x | x | x | x | x |
| Transmission Belts | x | x | x | x | x | x | x | x | x | x |
| Flexible couplings | x | x | x | x | x | x | x | x | x | x |
| Sealing strips | x | x | x | x | x | x | x | x | x | x |
| Mats and Flooring | x | x | x | x | x | x | x | x | x | x |
| Industrial gloves and clothing | x | x | x | x | x | x | x | x | x | x |
| Rubber rollers | x | x | x | x | x | x | x | x | x | x |
| Printing blankets | x | x | x | x | x | x | x | x | x | x |
| Textile cots, combs, etc. | x | x | x | x | x | x | x | x | x | x |
| Electric cable jackets | x | x | x | x | x | x | x | x | x | x |
| Abrasive wheels and points | x | x | x | x | x | x | x | x | x | x |
| Press and die pads | x | x | x | x | x | x | x | x | x | x |
| Coated and impregnated fabric | x | x | x | x | x | x | x | x | x | x |
| Artificial leather | x | x | x | x | x | x | x | x | x | x |
| Impregnated paper | x | x | x | x | x | x | x | x | x | x |
| Heels and soles | x | x | x | x | x | x | x | x | x | x |
| Sponge Rubber products | x | x | x | x | x | x | x | x | x | x |
| Hard Rubber products | x | x | x | x | x | x | x | x | x | x |
| Household and Kitchen articles | x | x | x | x | x | x | x | x | x | x |
| Cements and adhesives | x | x | x | x | x | x | x | x | x | x |

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. EXTREME OIL RESISTANCE—insuring dimensional stability of parts.
2. HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.
3. ABRASION RESISTANCE—50% greater than natural rubber.
4. MINIMUM COLD FLOW—even at elevated temperatures.
5. LOW TEMPERATURE FLEXIBILITY—down to -65° F.
6. LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.
7. AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.
8. HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.
9. NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

Submarines Awarded the Presidential Unit Citation

| | | | |
|------------------------------|--------|-------------|--------|
| Nautilus | SS-168 | Trigger | SS-237 |
| Trout* | SS-202 | Silversides | SS-236 |
| Wahoo* | SS-238 | Harder* | SS-257 |
| Guardfish (two citations) | SS-217 | Gudgeon* | SS-211 |
| Greenling | SS-213 | Tang* | SS-306 |
| Haddock | SS-231 | Seahorse | SS-304 |
| Bowfin | SS-287 | Rasher | SS-269 |
| Sailfish | SS-192 | Sandlance | SS-381 |

*Lost



EXIDE SALUTES 16 SUBMARINES

Honored by the Presidential Unit Citation ★

AS this is written, sixteen U. S. submarines have won the highest honor which can be awarded to a unit of our armed forces. Their achievements stand out among the proudest in American naval history. And the complete story is still to be told.

Ranging incredible distances, often to within gunshot of enemy shores, they have helped to swell the total of submarine-destroyed Japanese vessels to more than 1000—seriously crippling vital supply lines, and preparing the way for the great naval victories that followed.

Their phenomenal successes are a result of superb skill and a brave fighting spirit. As we salute these heroic ships, we take great pride

in the knowledge that all but one of them was powered by Exide Ironclad Batteries.

The same type of Exide Ironclads used to propel a 2000-ton submarine supplies power for lighting and air-conditioning thousands of passenger cars, keeping lights bright and compressors running efficiently even during long stops. Exide Ironclads are also used for cranking powerful Diesel locomotives. Wherever they serve, Exides are performing with dependability, long-life and ease of maintenance.



Exide
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

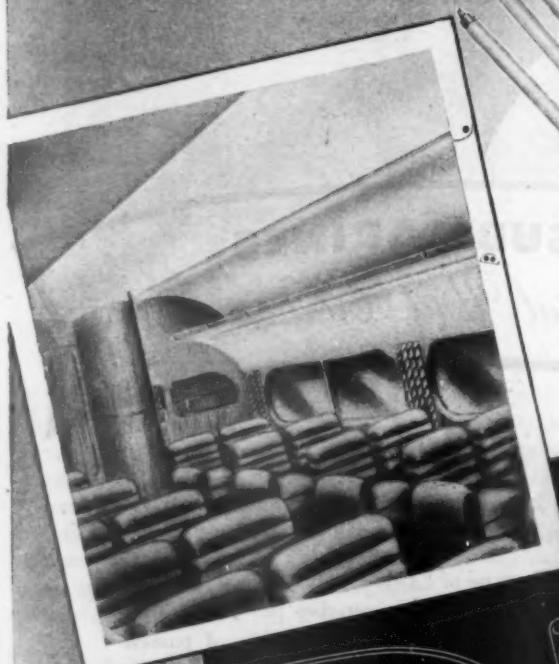
Another Product of General Electric Lamp Research

New G-E Mazda Slimline Fluorescent Lamps

Here's a brand-new lighting tool for tomorrow! A tool that offers greater flexibility in design and more versatility in performance. G-E Slimline lamps, with lengths up to eight feet, small diameter, and two levels of light from each size open up a variety of new lighting effects and services. Because they fit into small space and their light can be redirected more efficiently, G-E Slimline lamps permit many helpful new uses, especially in railway cars, stations and offices.

Other outstanding features: 1. Instant starting. 2. Long life. 3. Higher efficiency (approximately 60 lumens per watt). 4. Single or multiple operation. 5. Dependable uniformity. *Availability:* Quantity production will proceed as soon as conditions permit.

BUY MORE WAR BONDS
AND HOLD THEM



LIGHTING
DETAIL

Fit into small space for
continuous cove lighting

Permit compact shallow down-
lighting units to provide new
eye comfort for passengers

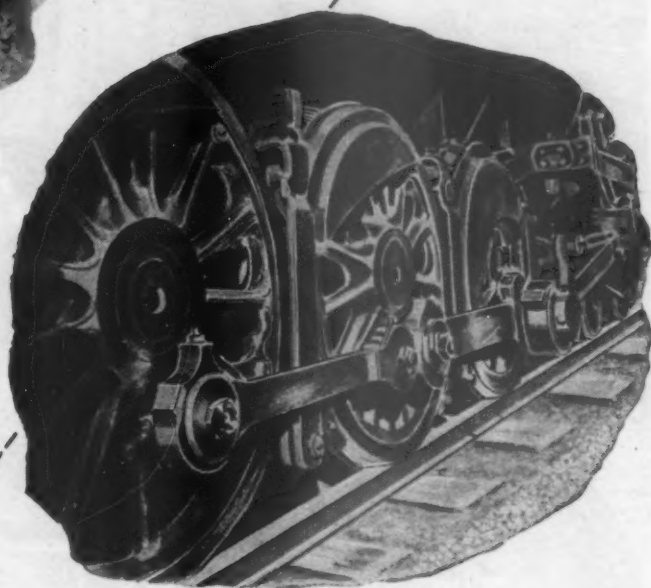
Hear the G-E
radio programs:
"The G-E All-Girl
Orchestra," Sunday
10:00 p. m. EWT, NBC;
"The World Today" news,
Monday through Friday 6:45
p. m. EWT, CBS; "The G-E
Houseparty," Monday through
Friday 4:00 p. m. EWT, CBS.

G-E MAZDA LAMPS

GENERAL  ELECTRIC



Prevents Fatigue Failures **ON THE ROAD**



A smooth, mirror-like machined surface is of utmost importance in avoiding failure of driving-wheel tires in service. For—a dull, non-reflecting surface indicates a rough finish having thousands of incipient fractures, which, when the tire is shrunk on the wheel and subjected to fatigue, may develop into cracks resulting in tire failure.

A "mirror" finish is obtained by machining at higher speeds with Kennametal—the tough, hard, durable cutting tool material that "peels off" the metal, instead of scraping it away. And—because Kennametal retains its edge, the bore is straight and true, which assures secure, uniform fit of tire to wheel.

On most tire machining jobs, Kennametal-tipped tools will take roughing and

finishing cuts simultaneously, at greatly increased cutting speeds, and with exceptionally long tool life. Similar advantages can be obtained in the machining of other parts, made of hard steel, tough, stringy alloys, cast iron, or non-ferrous materials.

Catalog 44 describes Kennametal . . . gives helpful information on tool design and application . . . lists prices that are now only about one-tenth of what they were when Kennametal tools were introduced eight years ago. A copy is yours for the asking.

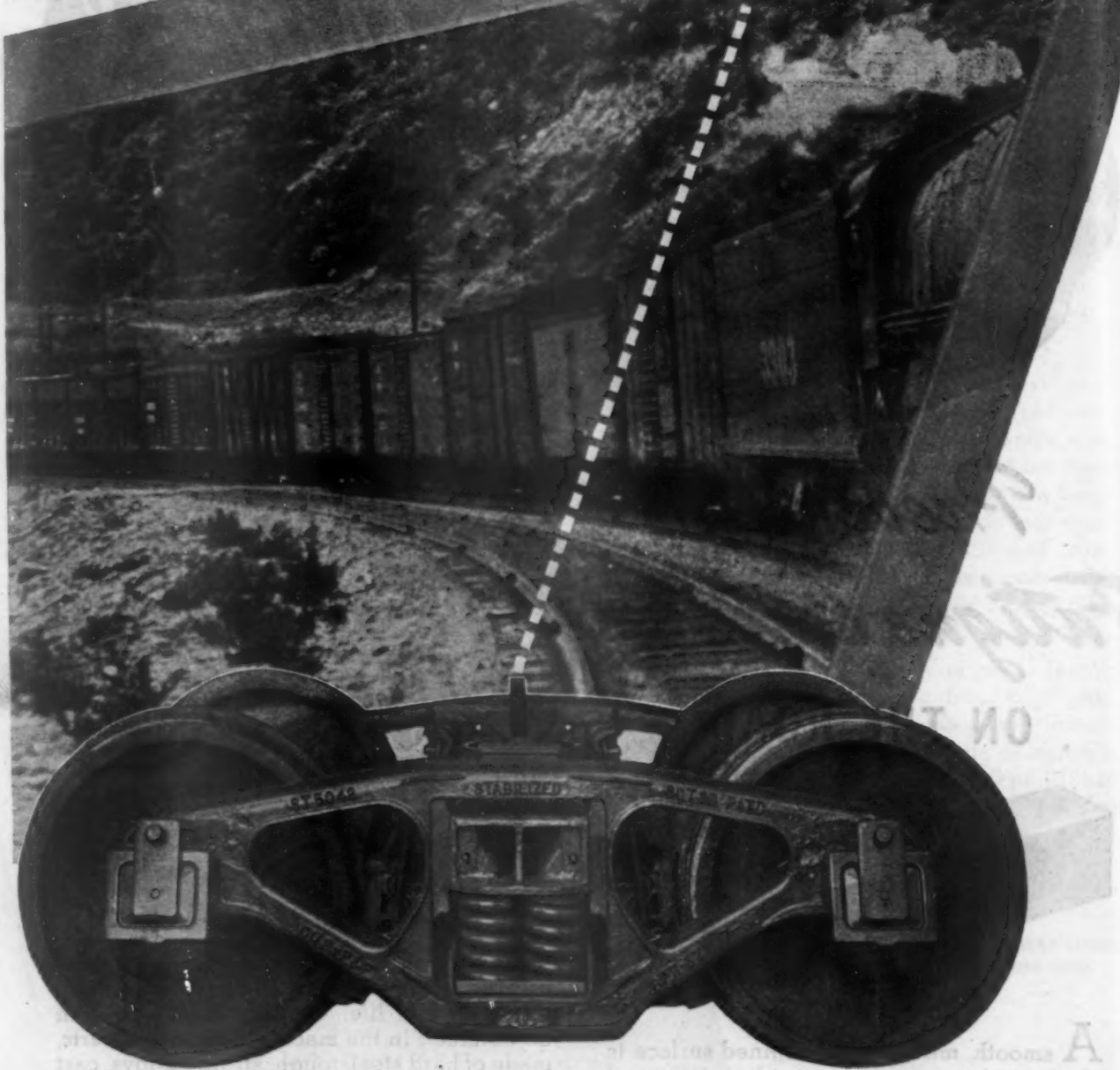


KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

BARBER Stabilized Trucks



For Smooth Riding Freight Cars

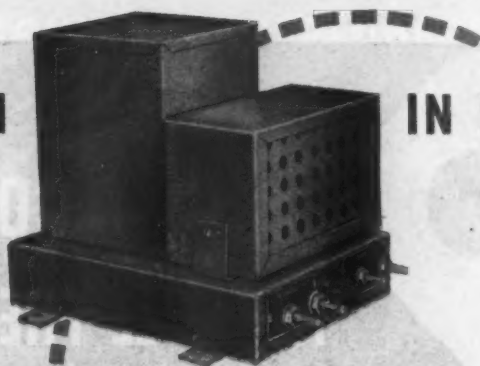
Low Initial Cost
Long Life
Dependable

Selected for over 92,000
Cars by 55 Railroads
and Private Car Lines

STANDARD CAR TRUCK COMPANY
332 SOUTH MICHIGAN AVENUE CHICAGO 4, ILLINOIS

FOR MODERNIZATION

IN RAILROADS



A VIBRATOR POWER SUPPLY

Belongs Here

... because it is the most efficient, reliable, and economical power conversion equipment available to make possible modern fluorescent lighting and two-way radio operation on all railroad trains.

FLUORESCENT LIGHTING

Fluorescent lighting not only means added comfort and beauty for modern lounge and dining cars as well as for coaches, but for the first time it brings really adequate illumination to passengers. Actual tests have shown that passengers definitely prefer this cool, more effective type of lighting. To the railroad operator it means increased passenger satisfaction, plus greater lighting efficiency and economy because fluorescent lamps provide twice as much light as incandescent lamps of equivalent wattage.

Electronic Laboratories has developed two current converting systems which are particularly good for the operation of fluorescent lights from the regular electrical systems of railroad cars.

Universal System—This compact, lightweight power conversion system permits the operation of ten 42" Slim-Line fluorescent lamps (2 circuits of 5 each), from 32 volts DC or any other input voltages desired. It produces over 30 lumens of light per input watt. The system incorporates dual series circuits, to provide the simplicity of series wiring.

However, individual lamp control is possible by short-circuiting any desired lamp in the series string, since the system automatically adjusts to the new operating load. Proper lamp operation is assured at all times, regardless of variations in input voltage, because of voltage regulation which has been built into the system.

Voltage-Doubler System—This *E-L* Power Supply System is especially economical where 32 volts DC is available as a power source. It consists of a voltage-doubler type converter which steps up the 32 volts DC to 64 volts DC from which twenty 14-watt fluorescent lamps may be operated. Lamps are connected in parallel which permits individual control, and the system produces 15 lumens of light per input watt.

TWO-WAY RADIO

E-L Power Conversion Equipment for the operation of two-way radio from 12, 32, 64, and 110 volts DC is now available for test radio installations, designed to your specifications. Electronic's experience in the design and manufacture of military radio power supplies, for which similar operating requirements prevail, assures your complete satisfaction.

Electric razors, or radio receivers may also be operated by *E-L* Power Supplies for the convenience of your passengers.

Write *E-L* engineers today regarding your plans.

E-L FLUORESCENT LIGHTING POWER SUPPLY MODEL S-946-A

The typical *E-L* model illustrated above may be utilized as a multi-channel unit for the operation of eighty 14-watt fluorescent lamps, by having four units run together. Specifications (of a single unit): Input, 32 volts DC; Output, 64 volts DC at 5 amps. Dimensions: 6-3/16 x 8-1/8 x 7-3/4 inches.



VIBRATOR POWER SUPPLIES FOR LIGHTING, COMMUNICATIONS, ELECTRIC MOTOR OPERATION
ELECTRIC, ELECTRONIC AND OTHER EQUIPMENT

Electronic
LABORATORIES INC.
INDIANAPOLIS

for CONTINUOUS TROUBLE FREE *Resistor* SERVICE

- ★ ALL STEEL CONSTRUCTION
- ★ MICA INSULATION
- ★ RUGGED TERMINALS
- ★ PROVISION FOR EXPANSION
- ★ ADEQUATE VENTILATION
- ★ UNAFFECTED BY VIBRATION
- ★ MOISTURE RESISTANT
- ★ CORROSION PROTECTED

Steel and Mica, the two basic materials entering the construction of P-G Steel Grid Resistors, are the foundation for continuous trouble free resistor service. P-G uses these materials in a unique design to provide both for expansion and for maximum ventilation. For more detailed information, ask for a copy of Bulletin No. 500 ★ ★ ★ ★ ★



The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

LOOK TO SYMINGTON-GOULD FOR DEPENDABLE PERFORMANCE



COMPOSITE ARTICULATED JOURNAL BOX LID



"COIL-ELLIPTIC" SPRING GROUP



TYPE "SBS" TRUCK SPRING SNUBBER



SWIVEL SHANK COUPLER AND YOKE



DOUBLE TRUSS SELF-ALIGNING SPRING PLANKLESS TRUCK

PROVED
Designs

The research, engineering and manufacturing "know how" behind Symington-Gould production goes back over 44 years. It is recorded in the performance of Symington products of *proved* designs:

**SIDE FRAMES AND BOLSTERS • COUPLERS AND YOKES • DRAFT ATTACHMENTS
JOURNAL BOXES AND LIDS • NON-HARMONIC TRUCK SPRINGS**

THE SYMINGTON-GOULD CORPORATION

Works: ROCHESTER & DEPEW, NEW YORK

New York • Chicago • St. Louis • Baltimore • Boston • San Francisco • In Canada: ADANAC SUPPLIES, LTD., Montreal, Que.

Most Capacity Per Pound—for Post-War Cars

When it comes to providing adequate capacity in the electrical systems on post-war cars with the least weight, an obvious solution is to select light-weight electrical equipment—including Edison Alkaline Batteries.

Not only are they the lightest weight type of battery available for railway-car service but they save weight where it counts most—near the middle of the car. The larger the kilowatt-hour capacity, the greater is the weight that can be saved by using alkaline batteries.

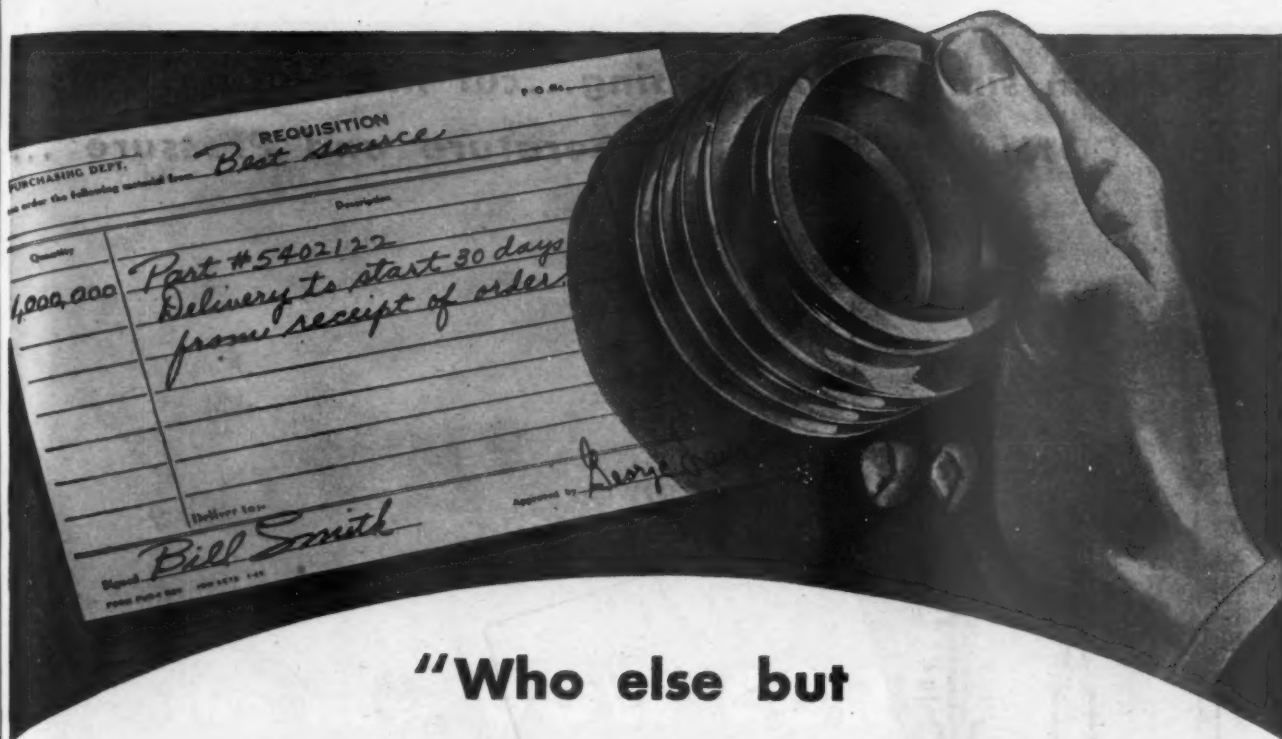
An outstanding reason for their light weight is their steel cell construction—a construction that gives alkaline batteries the further advantage of unequalled mechanical strength.

Alkaline batteries are equally suitable for use in 32-volt, 64-volt or 110-volt systems. They have been giving dependable service for many years in all three. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey.*

Edison
THE LIGHTWEIGHT BATTERY
FOR LIGHTWEIGHT CARS



The electrical system of this modern streamlined car provides power for air-conditioning equipment, ample lighting, and a variety of electrical equipment in the kitchen, all of which, taken together, play an important part in passenger comfort, and emphasize the desirability of lightweight, dependable storage batteries. Post-war cars, too, are expected to make extensive use of electric power.



"Who else but Aeronautical Products could turn out a part like this, in volume?"

LET today's planning be that Peace will come tomorrow! Overnight you must be ready to stop working for the few and begin to meet the demands of the many. What will you have to sell? New products . . . new designs for old . . . test models on which to form your production pattern . . . new parts for mass civilian production? Then, it's a job for Aeronautical Products!

API is the story of a vigorous American enterprise that became a production giant . . . proof that engineering brains, skilled workmen and precision machinery can work wonders. . . . Two great plants tooled to perfection . . . poised and ready to serve you completely. Write our Executive Sales Office for plant equipment facilities . . . be ready when the day comes!

BUY
WAR
BONDS



• Make ownership of a safe, sturdy Aeronautical Products Helicopter a "must" in your personal postwar plan. You'll find you can afford one!

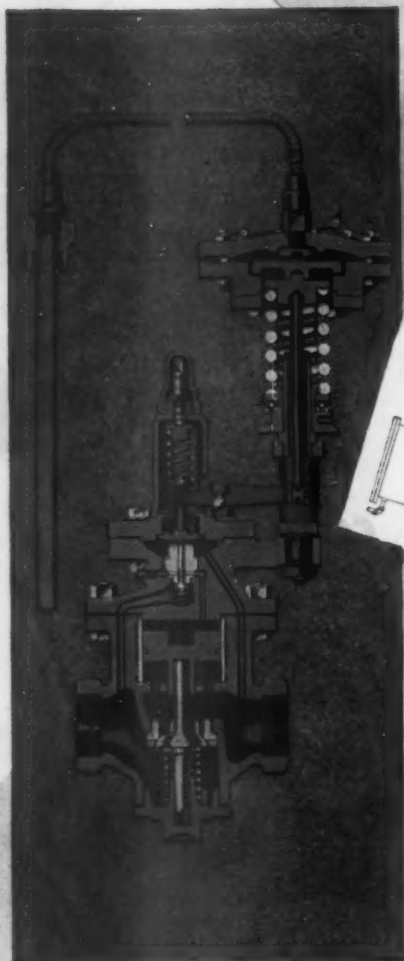
AERONAUTICAL PRODUCTS, Inc.

DETROIT PLANT
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Ohio

**"We can simplify our piping...cut installation costs—
and CONTROL BOTH Temperature and Pressure"...**



features...

DUO-MATIC CONTROL—Temperature Regulation and Pressure Reduction with a **SINGLE** regulator.

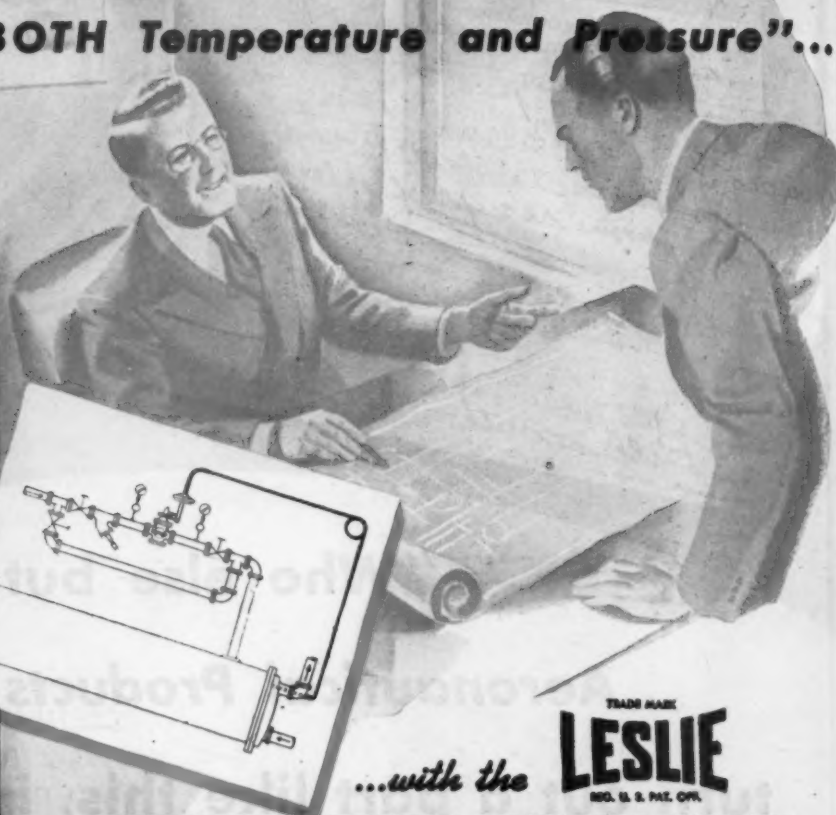
WIDE RANGE, RUGGED THERMOSTATIC ELEMENT—100°F adjustable temperature.

SINGLE SEATED for positive dead-end control.

METAL DIAPHRAGMS—No bellows or packing glands.

RENEWABLE WEARING PARTS—100% interchangeability.

CORROSION & WEAR RESISTANT—Stainless Steel Hardened Wearing Parts.



TEMPERATURE REGULATOR *SELF-CONTAINED*

Anywhere in your plant—wherever you want to guard your least or your most important processes with **BOTH** accurate temperature regulation and pressure control, simultaneously—you can easily and quickly install the Leslie Temperature Regulator with the assurance of absolute dependability of results.

• **EXTREME ACCURACY AND SENSITIVITY**

This Regulator was designed for accurate, dependable control where other regulators failed. In brief, it holds temperatures constant, in the closest limits, with the *minimum* expenditure of steam.

• **MAY WE HELP YOU?** Leslie Engineers are prepared to work with you to help you select the correct type of Leslie product for your needs and to advise you regarding the most effective methods of installation. When writing please give complete details as requested in our bulletins.



FOR COMPLETE DETAILS

WRITE FOR BULLETIN 404A

LESLIE CO. • LYNDHURST • NEW JERSEY

from sand . . .

SILASTIC

the new DOW CORNING SILICONE RUBBER

SILASTIC QUALIFIES EQUIPMENT UNDER GRADE 1, CLASS 1 SPECS.

Resistors coated with SILASTIC SC-75 operate successfully at 275°C. and take the plunge from 275°C. into ice water nine successive times. This seemingly impossible shock performance permits resistors coated with SILASTIC SC-75 to qualify under Grade 1, Class 1 Specifications.

"Newsworthy" is the development by Dow Corning of yet another—and perhaps greater—contribution to the new-day efficiency and resourcefulness of American industry. SILASTIC* is the name of the product and silicone rubber is the achievement.

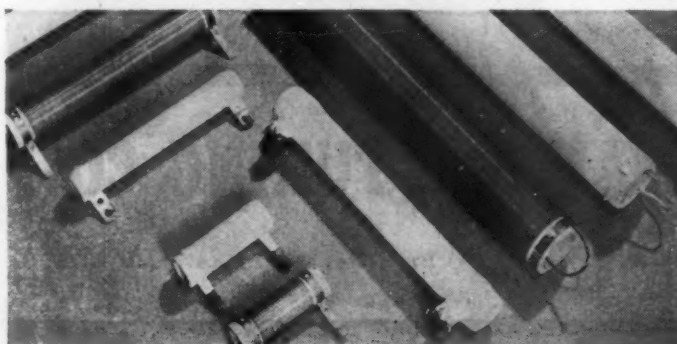
SILASTIC covers a variety of elastic silicone products made by Dow Corning from sand, modified by chemicals drawn from brine, coal and oil.

Being silicone rubber, SILASTIC exceeds in thermal stability the rubber we've known, whether natural or synthetic. SILASTIC retains complete flexibility—does not harden—in the temperature range—70°F. to 500°F. Its excellent dielectric properties—its arc, corona and oxidation resistance—assure durability of wire insulation under hot, wet service conditions.

For the immediate broad field of its usefulness, SILASTIC stocks are available for application by coating, extruding and molding.

DOW CORNING CORPORATION • MIDLAND, MICHIGAN
ADDRESS ALL INQUIRIES TO BOX 592

*TRADE-MARK DOW CORNING CORPORATION



Dow Corning

FIRST IN SILICONES

TRAIN LIGHTING



for **CAR LIGHTING**
and **HEADLIGHTING**
See Electric Service

**DESIGNERS,
ILLUMINATION ENGINEERS
and MANUFACTURERS**

ELECTRIC SERVICE MANUFACTURING CO.

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High-Balling!

... with the SAFETY FACTOR of RELIANCE LOCOMOTIVE HY-CROME SPRING WASHERS

War-time schedules demand top performance of your motive power. Trains are heavier, rolling faster. Troops and supplies for the Armed Forces must move safely and on time. Civilian freight and passenger service cannot be relaxed. Every improved method of maintaining efficiently tight motive power assemblies must be used . . . and Reliance Locomotive Hy-Crome Spring Washers are doing their part.

Reliance Locomotive Hy-Crome Spring Washers contribute an added factor of safety to over 50 vital points on a locomotive. Correct bolt tension is assured by Reliance design which provides constant thrust to compensate for inevitable looseness resulting from wear. Keep motive power bolts secure with Reliance Locomotive Hy-Crome Spring Washers.



"Tension There In
Spite Of Wear"

EATON

EATON MANUFACTURING COMPANY

MASSILLON, OHIO

Reliance Division

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

SPEED VICTORY - BUY MORE BONDS IN THE MIGHTY 7th



OUT GOES SPOILAGE!

Hamstrung by work-spoiling driver skids while he used slotted screws, a certain radio cabinet manufacturer made a complete switch-over to Phillips Recessed Head Screws. Result: production shot up like a rocket!



DOWN GO COSTS!

With this upward swing in production, there was a consequent downward swing in costs. A downswing that was helped along plenty by the fact that Phillips Screws drive up to 50 percent faster!



UP GOES STRENGTH!

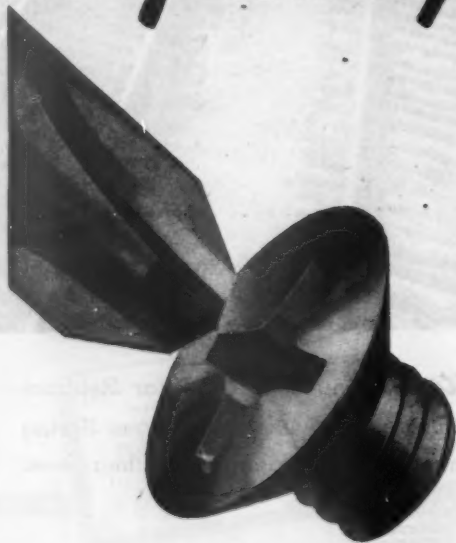
On production . . . on costs . . . yes, also on design, . . . use of Phillips Screws makes a big difference. Engineered for heaviest driving pressures, they help designers plan exceptional strength and rigidity into products!



AWAY GOES SALES RESISTANCE!

Saleswise, too, use of Phillips Screws pays off. They not only add to a product's strength, smartness, and general good looks. They also banish burrs that snag clothes and sidetrack sales!

It's Phillips the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

... It's the exact pitch of the angles that eliminates driver skids.

... It's the engineered design of the 16 planes that makes it easy to apply full turning power - without reaming.

... It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% - cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.

The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.

Pheoli Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdall & Ward Bolt & Nut Co., Port Chester, N. Y.
Sevill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

National Re-Design Cuts Operating Temperature

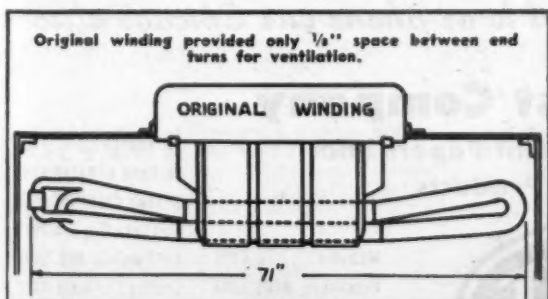


Above is photo of a 10,000 KVA, 300 RPM, 11,000 Volt, 1 Phase, 60 Cycle, 910 Amp. Synchronous Condenser rewound by National Electric Coil Company to provide lower operating temperatures at increased loads. Drawings below show original winding (left), which operated with 100% load at 57.2° C., and re-designed winding (right), now operating with 104.6% load at 48.3° C.



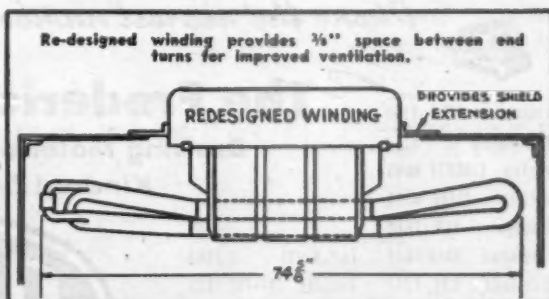
RAILROAD ELECTRICAL POWER PERFORMANCE IMPROVED

The re-design job done by National for a large railroad, illustrated and described here, is not unusual. National engineers have solved a great many railroad rotating electrical equipment problems involving high ambient temperature, increased load, moisture and just about every other electrical ailment. Wide, intensified railroad experience has given us the "know-how" which railroad work requires. When you call your nearest National field engineer, or write us, you're through experimenting. You get results.



57.2° C.
Average
Temp.
(100%
Load)

48.3° C.
Average
Temp.
(104.6%
Load)



NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16,

ELECTRICAL ENGINEERS; MAKERS OF
ELECTRICAL COILS AND INSULATION—



OHIO, U. S. A.

REDESIGNING AND REPAIRING OF
ROTATING ELECTRICAL MACHINES

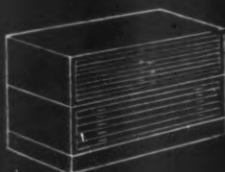
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Four Post Wood Tables. Send for prices and information on delivery.



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Which will you have?

THIS.. OR THIS



CAR WITH UNTREATED DECKING IN FOR REPAIRS
AFTER 5 YEARS



CAR WITH PRESSURE-TREATED SIDING AND DECKING
IN FOR REPAIRS AFTER 14 YEARS

A lot of railroad men today are asking themselves whether they can afford to continue the use of untreated decks. The pictures shown above tell why.

The car at left, with untreated decking, is in bad condition after only 5 years' service. The car at right, with pressure-treated deck-

ing, is in better condition after 14 years' service. The treated siding has been damaged, but there is remarkably little breakage and no decay.

Based on typical costs as reported by a user, the yearly charge for the treated deck was less than half that of the untreated deck. Or,

to figure it another way, the treated deck paid for itself in less than two years of additional service . . . and for the next seven years the installation returned a "profit" of over \$20.00 annually.

We advocate the treatment of car lumber, and will be glad to quote on your requirements.

KOPPERS COMPANY, INC. • WOOD PRESERVING DIVISION
PITTSBURGH 19, PA.

KOPPERS

Buy War Bonds
— and Keep Them!

THE INDUSTRY THAT SERVES ALL INDUSTRY



ADVANCE STYLE NOTES FOR POST-WAR PASSENGER CARS

Coaches

SNACK BAR in coach serves prepared foods, drinks, magazines. Armstrong's Linoleum covers top and front of bar. Linoleum is colorful, sanitary, easily cleaned. Flashed to sidewalls, it eliminates crumb-catching crevices.



COLORFUL, STREAMLINED surfaces that sweep around sidewall and bulkhead areas are covered with tough, flexible Armstrong's Linowall. This durable linoleum-like material is easily installed, without seams, over continuous curved surfaces. Design is inlaid.

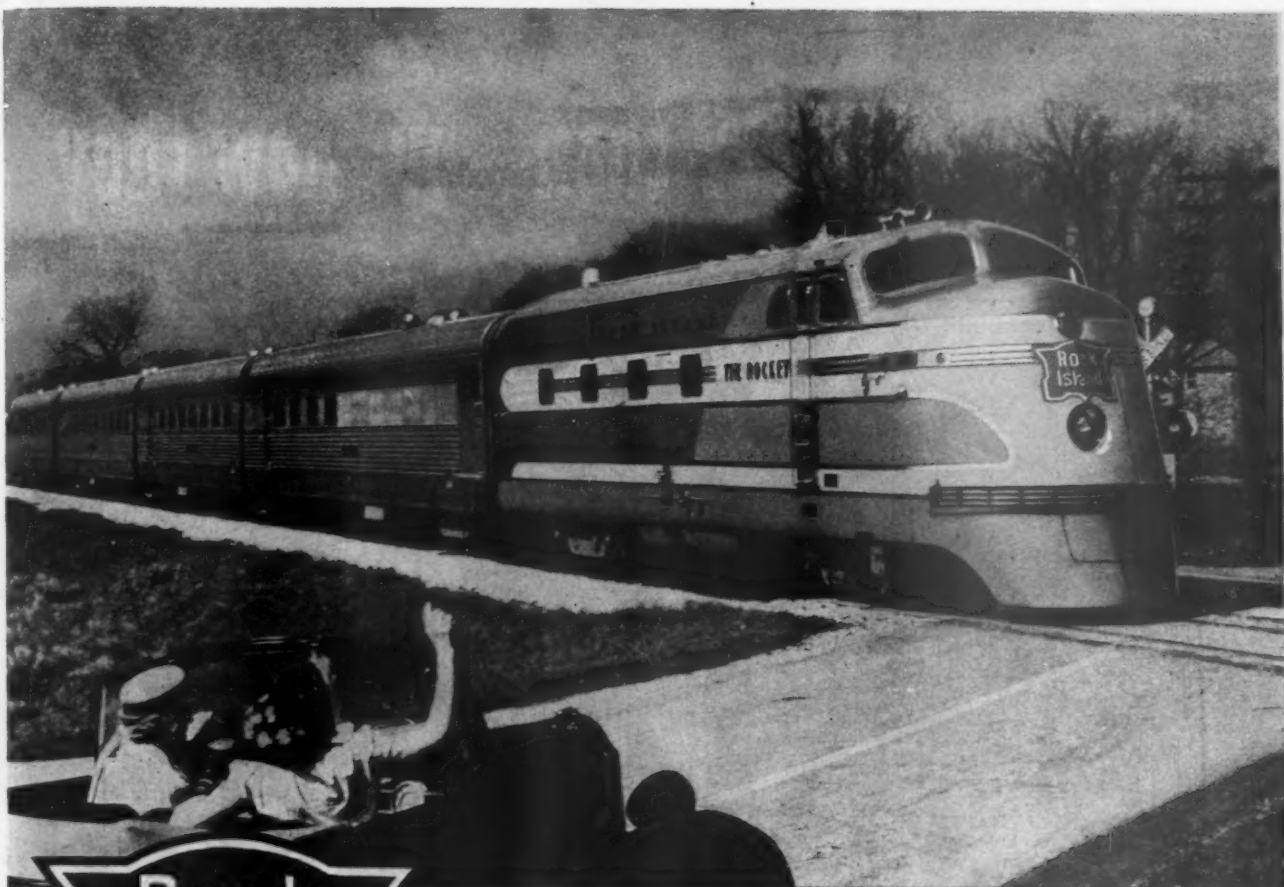
ATTRACTIVE, DURABLE Armstrong's Linotile (Oil-Bonded) offers wide possibilities for decorative floor designs to enhance car décor. Individual designs can be inlaid. Cleaning is simple and speedy. Armstrong's Cork Base Underlayment saves weight, resists indentation, can be used over any type of floor plate.

ARMSTRONG'S versatile floor and surfacing materials provide durable smartness, striking color and design effects for every type of passenger car. For complete information and free samples of Armstrong's Linoleum, Linowall, and Linotile, write Armstrong Cork Company, Industrial Division, 7406 Arch Street, Lancaster, Pa.



ARMSTRONG'S FLOORS

AND SURFACING MATERIALS



The Rock Island Peoria Rocket

**Rock
Island**

uses the SPICER

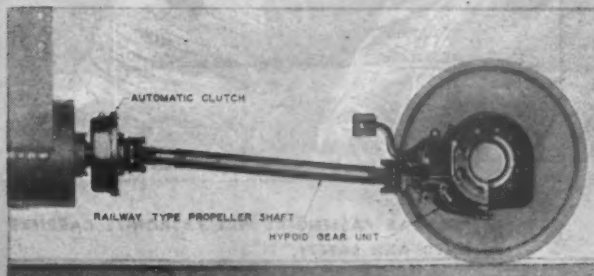
Positive Generator Drive

THE Rock Island Peoria Rocket is another of the nation's crack trains using Spicer Generator Drives. All over America . . . on 27 different lines . . . more than 2000 of these reliable Spicer Drives are delivering steady, dependable generator power for lighting, air conditioning and refrigeration equipment.

In the modernization of your existing cars, and the development of new cars incorporating high standards of passenger comfort, you must give paramount consideration to the requirements for increased and more dependable electric power. Air conditioning, electrostatic air cleaning, greater lighting, electro-mechanical water coolers, radios, and electric kitchen equipment will require the

reliable, steady flow of power delivered by the Spicer Positive Generator Drive.

The Spicer Drive consists of a very simple application of long-lived hypoid gears and pinion mounted on the standard railway car axle. Features include high efficiency and economy, safety, quietness and smoothness. Write for full details and literature describing *all* the profitable advantages Spicer Positive Generator Drives make available to you.



42 YEARS OF

Spicer
SERVICE

Positive Generator Drive

Manufactured, Sold and Serviced by
Spicer Manufacturing Corporation, Toledo, Ohio

It was **LUXURY** then—but now they



MODERN PASSENGERS WILL PATRONIZE CARRIES THAT OFFER THE MAXIMUM COMFORT, SERVICE,
AND SAFETY.

Modernize with **Westinghouse**

expect COMPLETE MODERNIZATION

... modernization made possible by the Axle Generator

Over 50% of the railroad passenger cars now in use are over 25 years old. Many of these cars will be replaced or completely modernized . . . to meet tomorrow's requirements for new travel comfort and convenience. Passengers will expect new designs, new furnishings, up-to-date electrical equipment.

For this reason, postwar plans must include modernization features such as . . . air conditioning . . . electric water coolers . . . improved lighting . . . air cleaners . . . improved power supply . . . and other engineering improvements.

These modernization features require large generators . . . with increased margin of capacity. Westinghouse has developed the Axle Generator that can adequately carry these increased loads. Investigate the numerous advantages of the Westinghouse Axle Generators. Ask your Westinghouse office for a copy of "Development of Electrical Equipment for Standard Railroad Passenger Cars".

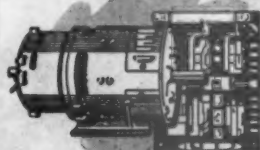
J-95101

WESTINGHOUSE AXLE GENERATOR

Axle Generator and auxiliary motor are built in a single unit—constructed for mounting on the car body—adapted for driving from the car axle. Self-ventilated rolled steel frame includes removable covers and baffled openings for protection. Rating is 20 kw, 76 volts, 1500 rpm, and weight is 1315 pounds. Included are antifriction bearings. Class B insulation is used on armature and all field windings. In yards and during long station stops the stand-by a-c motor may be plugged into wayside power supply facilities to drive generator and maintain electrical service in the car. For details of the Westinghouse Axle Generator ask for "Control Equipment for YXG-1-A Axle Generator Specification".

Consult Westinghouse on your plans for passenger car modernization. Available are axle-driven generators and control for high-speed operation; compressor motor and control for air conditioning; fluorescent lighting equipment; Precipitron for electrostatic air cleaning of cars; water coolers; "De-ion" circuit breakers; and other equipment for efficient car operation. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

Air Conditioning...with Westinghouse Compressor Motor and Control



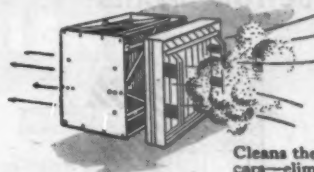
Strong, light-weight, compact construction of motor and control, assure dependable service.

Westinghouse Water Coolers

Electric water coolers of ample capacity—"tailor-made" for railway service.

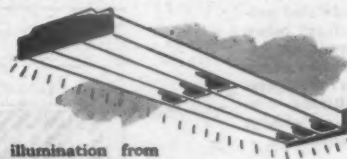


Air Cleaning . . . with Precipitron



Cleans the air in passenger cars—eliminates 90% of soot, smoke, dirt—permits smoking in every car.

Westinghouse Fluorescent Lighting



Better illumination from efficient new lamps—designed to fit new lighting plans.

"De-ion" Circuit Breakers



Permit maximum loading of circuits—quick resumption of interrupted service—positive protection.

RAILROAD ELECTRICAL EQUIPMENT



A Pleasure to
SEE

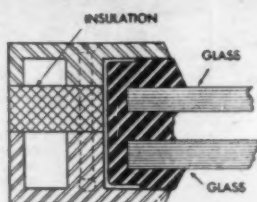
HOW ADLAKE WINDOWS PLEASE



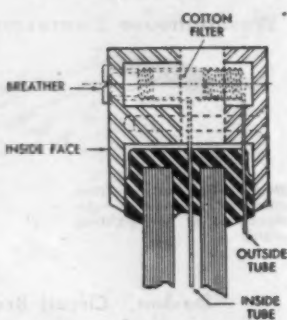
Adlake Windows use no dehydrating compound, hence there's none to replace. Except for routine washing or broken pane replacement Adlake Windows require absolutely no maintenance.

CONSTRUCTION DETAILS

Both frames of Adlake Sash are insulated from each other. This prevents cold from traveling to inside of unit—prevents frosting.



Note inside and outside "breather" tubes. These permit air between panes to adjust to changes in temperature and altitude—prevent clouding without use of a dehydrant.



Adlake CURTAINS should be included. They never shake, rattle or jangle. Swivel tips prevent change in length; rubber shoes stop noise and creeping. Ask for details about Adlake Curtains . . . Curtain Fixtures . . . Sectional Diaphragms . . . Vestibule Curtains.

BUY MORE WAR BONDS

...without any fuss,
or maintenance

NIGHT or day . . . high or low . . . hot or cold, Adlake Double-Glazed Sash Units remain unclouded and unfrosted, provide unhampered view. Passengers always see what's around them. To please *your* passengers specify Adlake in new or reconditioned cars.

The Adlake Breather—an exclusive principle—permits the air between the two panes to adjust quickly to temperature changes.

Adlake Double-Glazed Windows are again furnished in aluminum and can be aluminized if desired. They are designed and produced for new cars or for reconditioning present equipment. They are designed and built to standards that have won them a reputation for superiority throughout years of service. Write for prices and details . . . and specify Adlake.



THE ADAMS & WESTLAKE COMPANY

ESTABLISHED IN 1857

ELKHART, INDIANA

NEW YORK • CHICAGO

ADLAKE RAILWAY CAR EQUIPMENT, FITTINGS and SPECIALTIES • DOUBLE-GLAZED ALUMINUM WINDOWS • WINDOW CURTAINS • VESTIBULE CURTAINS • SECTIONAL DIAPHRAGMS • LUGGAGE RACKS • ASH RECEPTACLES • HARDWARE



A PUZZLE FOR OUR SCIENTISTS...

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Firsts

Solving Problems
for Industry

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BRAZED STEEL
FITTINGS

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HYDRAULIC BRAKE
LINES AND
BRAKE FITTINGS

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FIRE-RESISTANT
HOSE ASSEMBLIES

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THE WEATHERHEAD
T-RING PACKING

HOW TO SAVE YOU A PENNY

HAVE you thought much about performance of small parts in new peacetime products—and how much these parts cost?

Countless times since 1919 Weatherhead has been assigned the job of saving "a penny a part" for a manufacturer—and has solved the puzzle and delivered a finer part in the bargain. At Weatherhead this kind of thinking begins at the beginning—in the laboratory—where a steadily growing staff is trained to consider engineering, production

and marketing factors all as interlocking parts of each job at hand.

One of many examples:—When hydraulic brakes were adopted for the automobile, Weatherhead developed a hydraulic brake line only one-half the size of those previously used, and produced it for less cost to the automotive industry.

That's why we can say, "Look ahead with Weatherhead." We invite you to write our Sales Engineering Department for assistance in solving your postwar parts problems now.

Look Ahead with



FREE: Write on company letterhead for "Soods Of Industry"—

24-page illustrated story of Weatherhead facilities and products ready to serve you.

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND 8, OHIO
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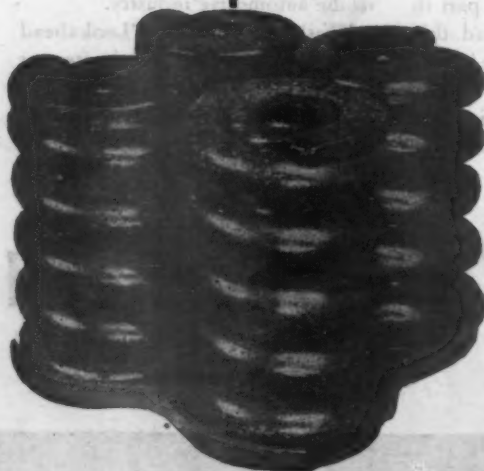
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Swallow up the Shocks

**Vibration and Recoil
Curves**

A.A.R. STANDARD SPRING GROUP

**HOLLAND SNUBBER
SPRING AND
3 A.A.R. SPRINGS**

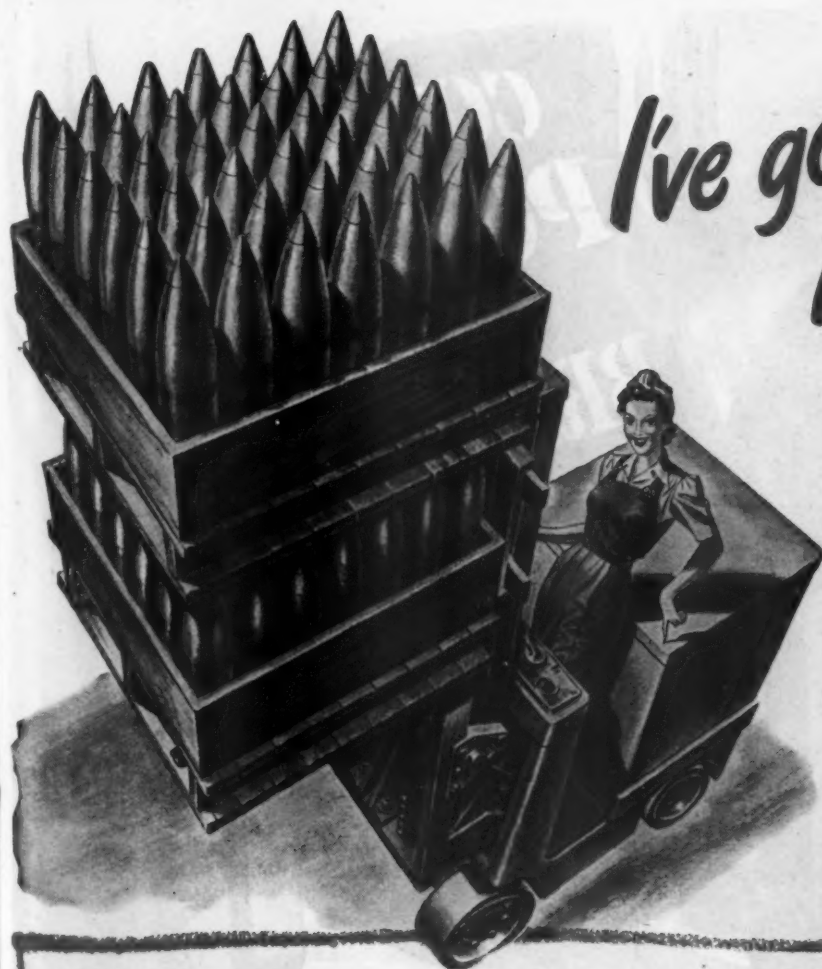


Style A-6-A Holland *Volute* Snubber Springs

HOLLAND

COMPANY

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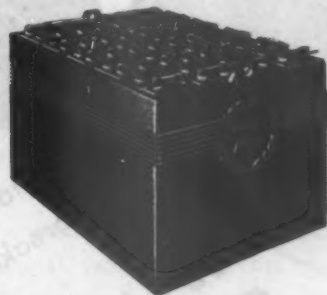
*I've got a Philco
in here...*

*a Philco "Thirty"—
the Electric Truck
Battery with*

*30% Longer
Life!*

FOR 50 YEARS PHILCO HAS BEEN A LEADER IN INDUSTRIAL BATTERY ENGINEERING

To operators of electric industrial trucks a PHILCO has long meant a big storage battery that provides the power to move great pallet loads of materials. For more than 50 years, important developments in storage battery design have come from Philco engineers. The latest of these is this revolutionary new Philco "Thirty", with 30% longer life! It's the toughest battery ever built for heavy industrial motive power service. Its far longer life is news of the utmost importance for all who seek lower costs in materials handling, today and after the war. There's a Philco Storage Battery for every need in industry—mine haulage, railway service, oil switch control, telephone service, and many others. Write for latest catalogs.

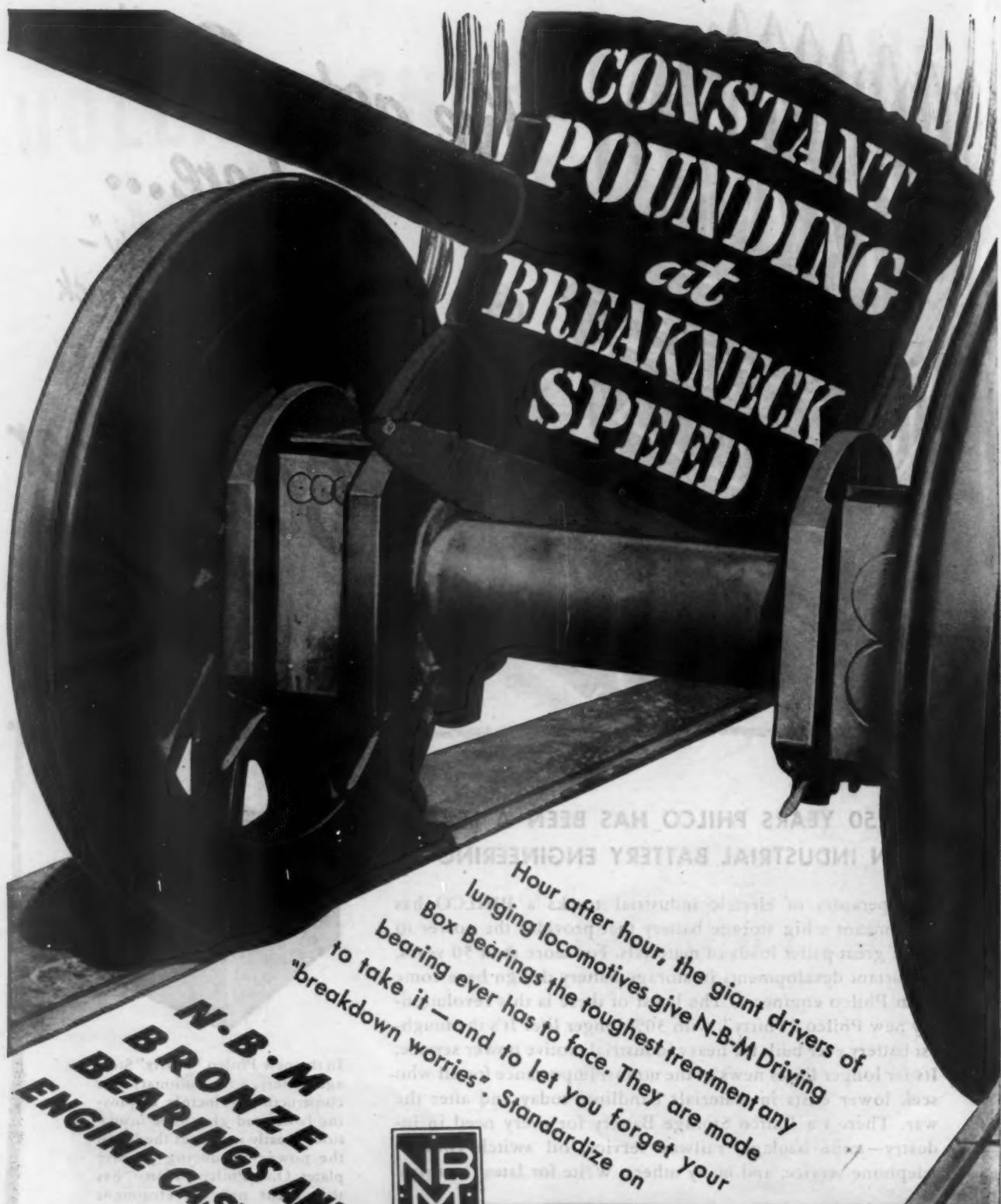


In the new Philco "Thirty" Storage Battery, a revolutionary new construction principle employing fabricated glass tape insulation, greatly increases the life of the power-producing positive plates. Only Philco "Thirty" has this great new development which adds 30% and MORE to Storage Battery life.

FOR THE LATEST IN MODERN BATTERY DESIGN... SPECIFY

PHILCO Storage Batteries

PHILCO CORPORATION • STORAGE BATTERY DIVISION • TRENTON 7, NEW JERSEY



**CONSTANT
POUNDING
at
BREAKNECK
SPEED**

Hour after hour, the giant drivers of lunging locomotives give N-B-M Driving Box Bearings the toughest treatment any bearing ever has to face. They are made to take it — and to let you forget your "breakdown worries". Standardize on

**N-B-M
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ST. LOUIS • NEW YORK



PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

PROTECTOSEAL



CROSS-SECTION OF CAN
SHOWING FIRE BAFFLES

SUPPLY CANS WITH BUILT-IN FIRE BAFFLES

PREVENT LOSS. Protectoseal Supply Cans prevent loss by evaporation because fill opening, spout, and special vent have automatic closures. The flexible spout eliminates waste and time lost fussing with funnels. The special vent permits fast pouring; a full five-gallon can can be emptied in less than a minute.

PROVIDE SAFETY. Both fill opening and spout, as shown in the cross-section above, have double perforated fire baffles to prevent ignition of the can's contents. Heavy construction, double seamed and soldered joints, and reinforcing bottom rim ring, prevent breakage of can and loss of contents from rough handling.

REDUCE WASTE. The leakproof, self-closing valve on the spout, operated by the carrying hand, permits accurate control of pouring to eliminate waste from spilling or slopping. Not a drop of liquid need be lost.

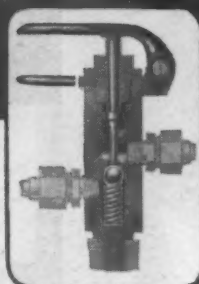
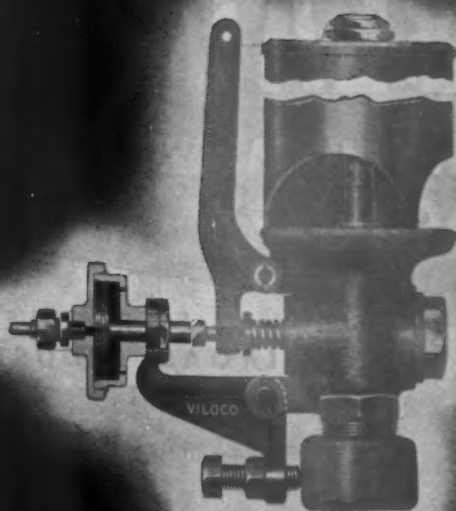
APPROVED. Protectoseal Supply Cans, made in 3-gallon and 5-gallon sizes, are approved by Underwriters' Laboratories and Associated Factory Mutuals. *Write today for complete data on the PROTECTOSEAL line of Fire Baffle Fill and Vent Fittings, Safety Cans, Plunger Cans, and Wash Tanks.*

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Viloco

PNEUMATIC WHISTLE OPERATOR

The Viloco Pneumatic Whistle Operator, attached to the steam whistle with Operating Valve, conveniently located in the cab makes it easier for the engineer to sound warnings and signals.

A light "squeeze" of the valve handle effects instantaneous response of the whistle. An additional valve located on the fireman's side permits whistle to be operated from either side of the cab.

The application of this operator is especially desirable where the whistle is located near the front end of the locomotive as the complicated hand operating rigging is eliminated. The operating cylinder can be attached to any type of whistle by means of a suitable bracket.

VILOCO RAILWAY EQUIPMENT CO.

332 SOUTH MICHIGAN AVENUE • CHICAGO

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**HEAVY METAL WORKING
MACHINERY**

**... FOR THE
RAILROAD INDUSTRY**



Our long experience building special equipment for railroad shops is available to you at any time. Perhaps a BEATTY engineer has already solved that heavy metal working problem you are now facing. To find out, phone or write us today. BEATTY equipment is now

serving leading railroad shops and car builders across the country. Let this experience gained through close contact with your industry serve you.



BEATTY MACHINE & MFG. COMPANY
HAMMOND INDIANA

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35-45, EE or equivalent. Maintenance of heavy electrical and mechanical equipment. Location Northern New Jersey. R.M.E. 1283, 113 W. 42 St., N. Y., 18, N. Y. WMC rules observed.

RARE OPPORTUNITY

Wanted - Equipment or Operations Engineer

Prominent nationwide manufacturer of transportation equipment has excellent opening for aggressive, energetic man of youthful outlook with extensive knowledge of railroads and railroad equipment. Engineer graduate preferred. Reply in confidence giving details, etc. as to age, education, experience, availability. ADDRESS BOX 526, Railway Mechanical Engineer, 30 CHURCH STREET, NEW YORK 7, N. Y.

THE MIGHTY 7TH WAR LOAN

And now.



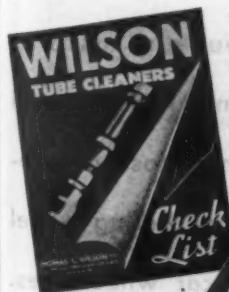
YOU CAN BUILD YOUR OWN TUBE CLEANERS

Have you ever wished that you had the facilities available to build your own tube-cleaners for special or unusual jobs? The chances are you can do just this—and do it easily too.

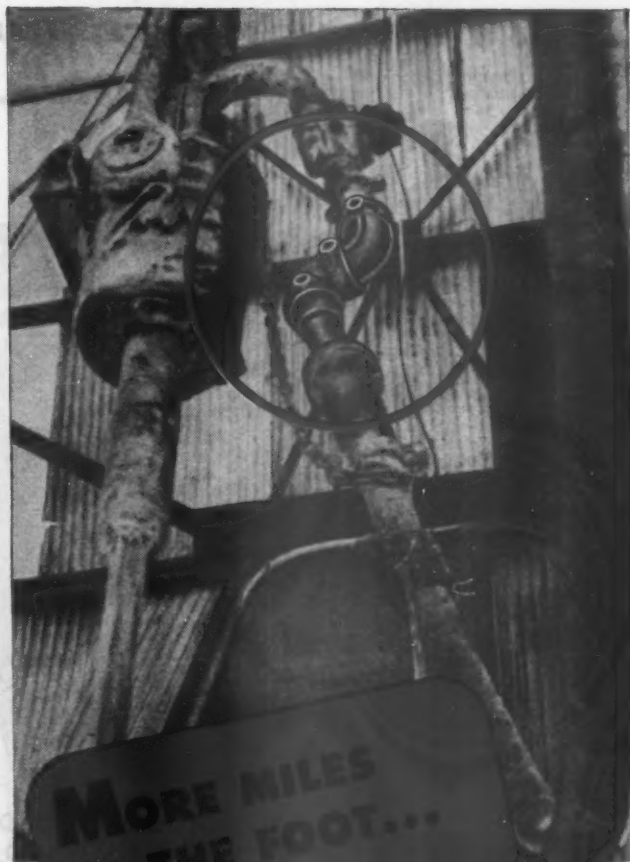
You can do it by selecting one of the numerous motors and one of the many cutter-heads from the large assortment of Wilson Tube Cleaners and parts that are available.

A copy of the Wilson Tube Cleaners Check-List will help you make this selection, and thus help solve your tube-cleaning problems. It shows various Wilson Tube Cleaners for practically every type of deposit in straight or curved tubes—tube cleaners that get the job done faster!

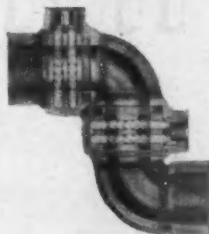
The Check-List also contains valuable information on operation and maintenance of tube cleaners. Your copy will be sent on request—and without obligation.



THOMAS C. WILSON Inc.
21-11 44th AVENUE, LONG ISLAND CITY 1, NEW YORK



**MORE MILES
TO THE FOOT...
with
CHIKSAN**



CHIKSAN

Formula for
Perfect Flexibility:

$$BB_2 + EP = \frac{P/V}{LT}$$

BB₂ = Double Rows of
Ball Bearings.

EP = Effective Pack-Off

P/V = Pressure or
Vacuum

LT = Low Torque

With oil wells going deeper and deeper, it may not be long until depths are stated in miles... not feet! Drillers get more miles of service per foot of rubber rotary hose by using a CHIKSAN Ball-Bearing Swivel as end connection (shown in photo above). You can protect your rubber hose and make it last longer, too, by using Chiksan Swivels for connection to gas, oil, air or water outlets ...and on all hose reels. Over 500 different types, styles and sizes for every purpose. Write for Catalog.

Representatives in Principal Cities.
Distributed Nationally by CRANE CO.



BALL BEARING
SWIVEL JOINTS
FOR ALL PURPOSES

CHIKSAN COMPANY
ARIZ. CALIFORNIA

***If it's a small part, turn it with
Precision, Speed and Profit on a***



Model S-56
10" Precision
Lathe

All SHELDON lead screws are cut on the finest Pratt and Whitney "Super-precision" lead screw machine.

**BUILDERS OF GOOD
LATHES SINCE 1919.**

SHELDON

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U. S. Army, the Navy and the Marine Corps for mechanized machine shops, instrument repair shops, etc.)

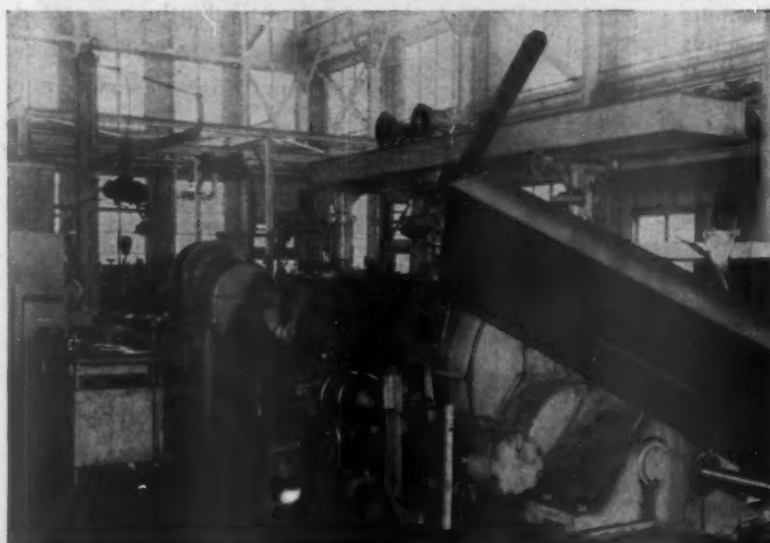
Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Heavy Bronze Bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

SHELDON MACHINE CO., Inc. • 4216 N. Knox Ave., Chicago 41, U. S. A.

GORHAM

HEAVY DUTY TURNING TOOLS



ALL PERFORMANCE tests of the Gorham Serrated Shank Insert Turning Tool prove that this design not only reduces original tool costs but also assures large savings in set-up and machining costs of locomotive driving wheel and car wheel tires.

GORHAM TOOL COMPANY

14400 WOODROW WILSON AVENUE

DETROIT 3, MICHIGAN



• Wheel Type SKILGRINDER shown above is only one of many SKILTOOLS that are stepping up repair and maintenance in car shops and on the right-of-way.

SKILTOOLS are better-designed, better-built to stay on the job longer, to handle easier and enable fewer men to get more done in less time.

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PORTABLE ELECTRIC
SKILTOOLS
MADE BY SKILSAW, INC.

Railroad Men Know...

What a Big Part
a small part
can play!



To right: Some Ex-Cell-O Hardened and Ground Steel Railroad Bushings and Pins.

The use of Ex-Cell-O Pins and Bushings does not interrupt train schedules through failures in service. They wear slowly, and the little wear that does occur (after hundreds of thousands of miles of service) is evenly distributed over all surfaces of the pins and bushings. The net result is lower maintenance costs . . . Ex-Cell-O Pins and Bushings can be depended upon to last for several shoppings without replacement.

Railroad Division

EX-CELL-O CORPORATION

Detroit 6, Michigan

HAIRINSUL IS PERMANENT INSULATION



**OUTLASTS
the CARS it
INSULATES!**

HAIRINSUL never settles, never pulverizes or develops ice-wasting spaces in your refrigerator cars. It keeps its high insulating efficiency *permanently* . . . dries out good-as-new after repeated soakings . . .



Hair Is Nature's Own Insulation
It's nature's protective covering for animal life . . . It's a barrier against extreme outside temperature changes. HAIRINSUL is made of animal hair . . . one of the best reasons why HAIRINSUL is accepted as the finest of insulating materials for refrigerator cars.

never rots, molds or decays. HAIRINSUL is *all-hair* in blanket form, recognized as the best form for greater ice-saving efficiency over a longer period of time. Flexible, easy to install in new or rebuilt cars . . . and you can get it now. Send today for samples and complete engineering data.

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ONE LEVER—

**provides
complete control**



Single lever hydraulic control of RACINE's Heavy Duty Metal Cutting Saws marks a new era in the efficiency of metal cutting machines. Gone are cams, weights, ratchets, levers and other outmoded methods of applying feed, lift and other operating functions.

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comparison proves

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"SIMPLEX" Open
Flame Furnace,
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500 to 6000 lbs.
Brass or Bronze.
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Hand Tilting Cru-
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or Oil Fired, up to
1800 lbs. Brass,
1000 lbs. Alumi-
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Pressure. Up to 15 H.P.
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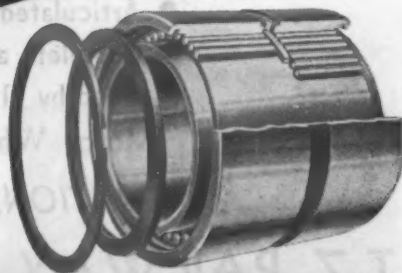
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THE PILLIOD COMPANY

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Factory—Swanton, Ohio

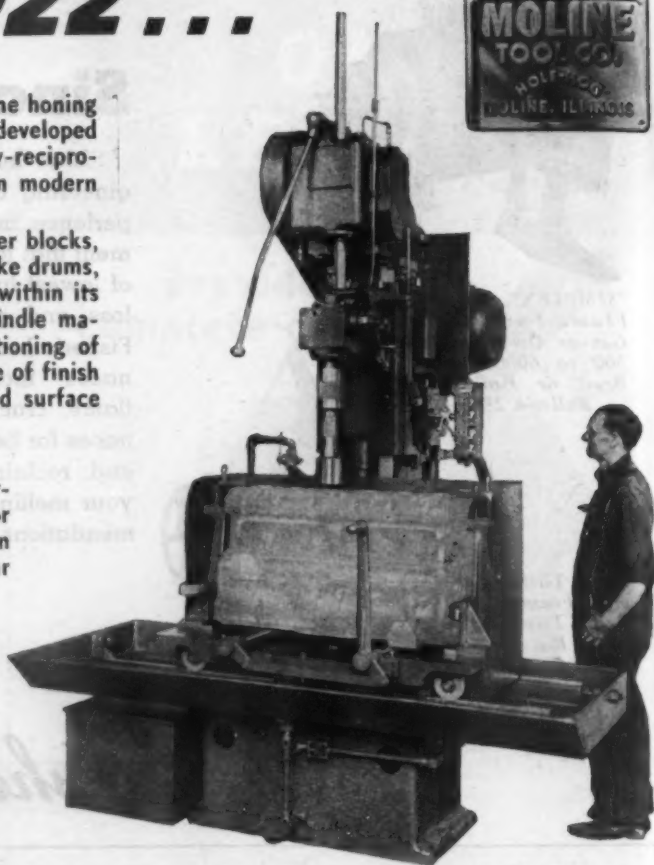
Ever Since 1922...

when the first Moline honing machine was built, Moline honing machines have been continually modernized and developed until the No. 15, vertical, single-spindle, hydraulically-reciprocated honing machine, shown here, is the ultimate in modern honing equipment.

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The No. 15 with fixture for honing the cylinders of a six-cylinder engine block.



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- Pressed steel lid.
- No tools required for application to journal boxes.
- Articulated assembly.
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- Complete access to box provided by 115 deg. opening.
- Furnished for 5 x 9, 5½ x 10 and 6 x 11 boxes.

Motor Wheel Lids Meet All A. A. R. Requirements

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properly

rolled joints, use

Airetool Tube Expanders

Airetool Tube Expanders offer you simplicity of operation, the proper tool for any individual job, and micrometer adjustments for precision rolling for any type of expansion or rolling job.

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510 Airetool & Yost-Superior Factory Bldgs.
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ADECO NOZZLE TESTER

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TESTS FUEL INJECTORS
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At Pressures Up To
10,000 p.s.i.

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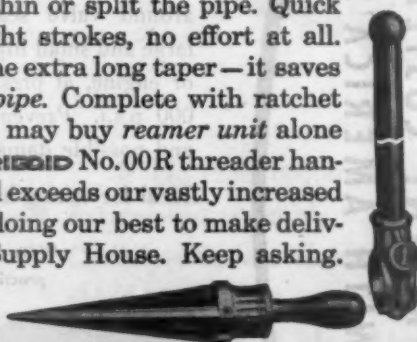
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RIGID
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Pipe Reamer



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**safe, easy
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burr only**

● It cuts the burr out clean as a whistle—but it doesn't gouge, thin or split the pipe. Quick easy feather-light strokes, no effort at all. The trick is in the extra long taper—it saves you work *and* pipe. Complete with ratchet handle—or you may buy reamer unit alone for use in your **RIGID** No. 00R threader handle. War demand exceeds our vastly increased output—we're doing our best to make deliveries to your Supply House. Keep asking.

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PROVED BY YEARS
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.. STOKER ENGINES
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EXPORT AGENTS: INTERNATIONAL STANDARD
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LUFKIN

MICROMETER DEPTH GAGES



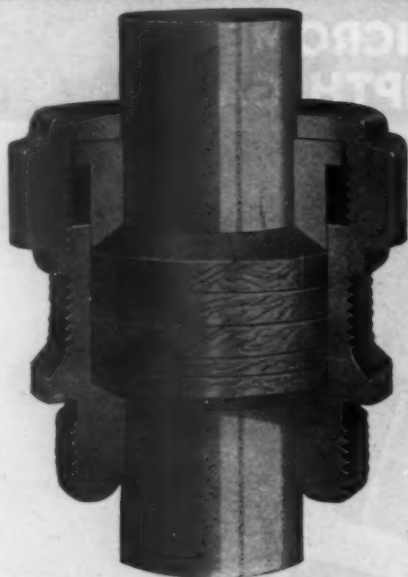
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TAPES · RULES · PRECISION TOOLS

DURAMETALLIC Air Pump Packing

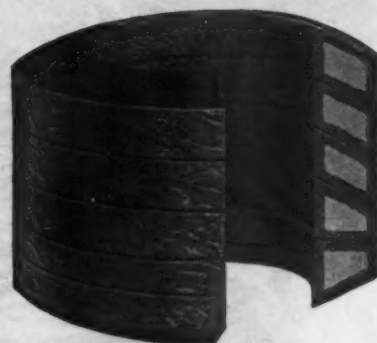


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**Engineered to Give Long Uninterrupted
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The true merit of Durametallic is established by its continued use for many years on thousands of locomotives on American railroads. Durametallic construction provides long service. Actual service records show from 75% to 90% reduction in worn rod replacements.

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All are C-F POSITIONERS



2500 LBS.

6000 LBS.

6000 LBS.

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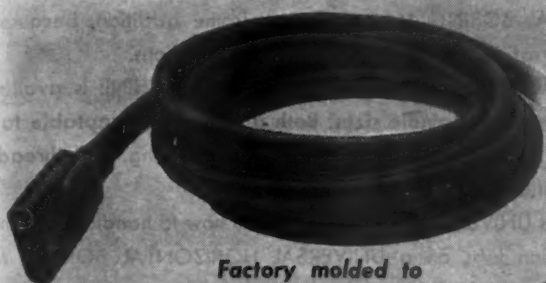
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capacities:

1,200 lb.
14,000 lb.
20,000 lb.
30,000 lb.

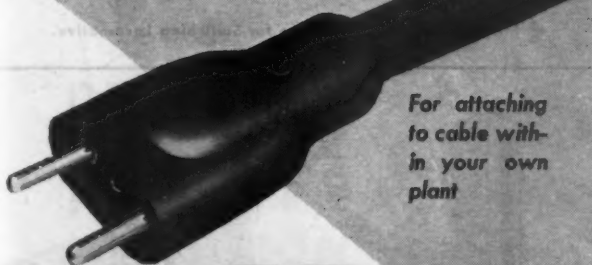
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WP-22

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Factory molded to special length cable



For attaching to cable with-in your own plant



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ING OF FLEXIBLE METAL HOSE!

● There are reasons for leadership in every line. Better performance, finer quality, greater versatility and dependability... these and many more have given REX-WELD Flexible Metal Hose the high reputation it has today. A reputation that has earned the confidence of industry everywhere. Industrial men know the advantages of REX-WELD. For this rugged, seep-proof, airtight product has been out-performing ordinary connections on a wide variety of applications throughout industry.

Let "Flexon," the C.M.H. trademark character, show you in the sketches below some of REX-WELD'S outstanding features. Then ask us to give you the full story about REX-WELD and the other flexible metal hose products in our complete line.



REX-WELD... Handles steam with utmost safety. It is seep-proof to gas, oil, water and seeping fluids. It is highly rust-resistant and non-deteriorating.



REX-WELD... operates efficiently under pressures up to 5,000 p.s.i., temperatures to 1,000° F. Greater strength and durability are the result of its 50-50 principle of corrugation... of an autogenous welding process that makes the weld stronger than the tube itself.



REX-WELD... is available in bronze and steel in sizes from 3/16-in. to 4-in. I.D. (incl.), with annular or helical corrugations, braided or unbraided depending on requirements. REX-TITE heatproof mechanical couplings are easy to install and are reusable.



Flexible Metal Hose for Every Industrial Use



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- ⑦ One shot lubrication for head; also for saddle and table assembly.



UNIVERSAL

BORING MACHINE COMPANY
HUDSON, MASS., U. S. A.

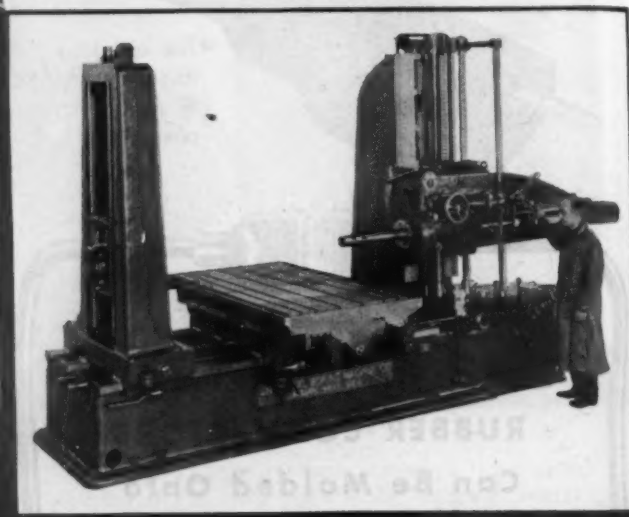
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OVER 30 YEARS

"NEW PROCESS"



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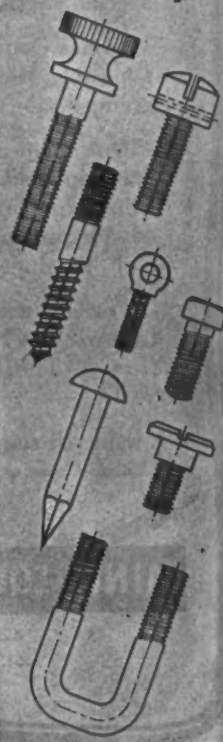
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TOLEDO 7, OHIO**

Model 80-A

Special type COLLET holds valve stem securely without brinelling or marking stem.

WET GRINDING prevents surface burning and stem growth; produces finer finish.

Handles valves to 5" head dia.

QUICK-ACTING CHUCK LOCK for quick, easy insertion or removal of valve.

FULL BALL BEARING SPINDLE insures smoother operation.

GRINDING WHEEL MOTOR

MICROMETER WORKHEAD FEED CONTROL Operator knows exact amount of metal being removed.

MASTER MOTOR SWITCH and CUTOFF SWITCH

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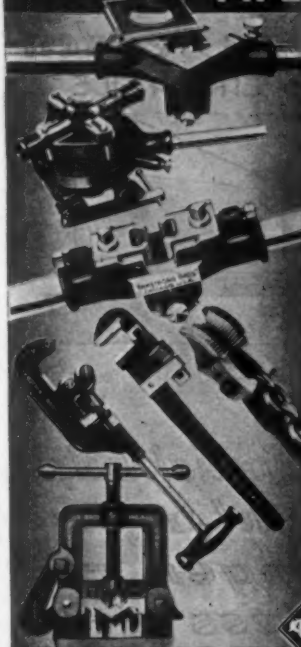
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DOVETAIL TYPE WAYS accurately machined. Spring-loaded bronze gibs compensate for wear.

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Look for the *Arm-and-Hammer* **ARMSTRONG BROS.** PIPE TOOLS



The "ARMSTRONG BROS." Line of Pipe Tools is the most extensive manufactured, including:

- Adjustable Dies and Stocks
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A couple of taps with a hammer drives the COOKE Cotter into place. It is securely locked in one operation—and it will stay there until removed. It is easily and quickly applied. You save time, money and promote maximum safety.

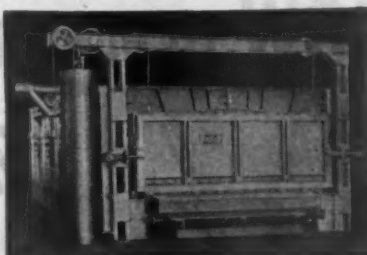
Note: This wedge opens, spreads and locks the cotter, thereby eliminating vibration and wear.



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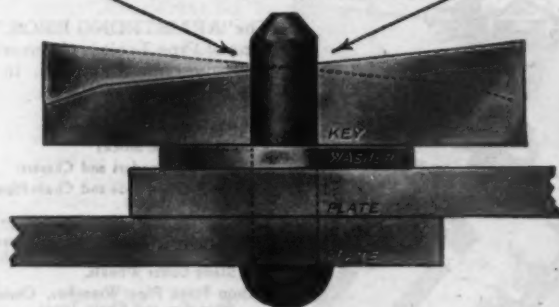
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DRIVE KEY FROM EITHER SIDE
DOUBLE ANGLE IN KEY SLOT

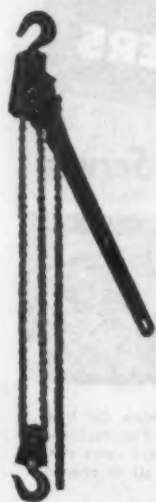


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Made in
5 Sizes

Operated
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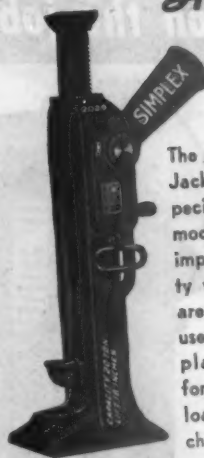
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hard way, investigate
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Driven Forge Ham-
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just one of the many
jobs you can do with
it.

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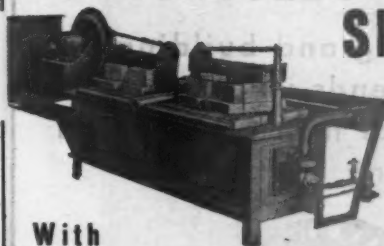
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INDEX TO ADVERTISERS

JUNE, 1945

| A | | G | | O | |
|---|---------------------|---|------------------------------|---|----------|
| Acme Machine Tool Co., The | 44 | Garlock Packing Company, The | 100 | Oakite Products, Inc. | 3 |
| Adams & Westlake Co., The | 146 | General Electric Company, | 15-18 incl., 24, 25, 53, 126 | Ohio Machine Tool Company | 61 |
| Aeronautical Products, Inc. | 133 | General Machinery Corp. | 10 | Oliver Iron and Steel Corporation | 120 |
| Aircraft & Diesel Equipment Corporation | 159 | General Steel Castings Corp. | 113 | Oster Manufacturing Company, The | 8 |
| Airetool Mfg. Co. | 159 | Get Together Dept. | 170 | Owens-Illinois Glass Co. | 161 |
| Air Reduction Sales Co. | 42, 43 | Giddings & Lewis Machine Tool Co. | 20, 21 | | |
| Ajax Manufacturing Company, The | 57 | Gisholt Machine Company | 33, 59 | | |
| Allmetal Screw Products Co. | 164 | Gorham Tool Company | 154 | | |
| Aluminum Company of America | 32 | Grancell, I. H. | 171 | | |
| American Arch Company, The | 68 | Grip Nut Company | 117 | | |
| American Brake Shoe Company | 84, 85 | Gustin Bacon Mfg. Co. | 122 | | |
| American Car & Foundry Company | 30, 31 | | | | |
| American Hair & Felt Company | 156 | | | | |
| American Locomotive Company, | 15-18 incl., 70, 71 | | | | |
| American Railway Products Co. | 166 | | | | |
| American Steel & Wire Company | 78, 79 | | | | |
| American Steel Foundries | 74 | | | | |
| American Tool Works Co., The | 49 | | | | |
| Anderson Mfg. Co., Albert & J. M. | 177 | | | | |
| Armco Railroad Sales Co. | 26 | | | | |
| Armstrong Bros. Tool Co. | 165 | | | | |
| Armstrong Cork Company | 142 | | | | |
| Association of Manufacturers of Chilled Car | 67 | | | | |
| Wheels | | | | | |
| B | | H | | P | |
| Babcock & Wilcox Tube Company, The | 88 | Hall Manufacturing Company, The | 165 | Paxton-Mitchell Company | 99 |
| Baldwin Locomotive Works, The | 4, 5 | Hennessy Lubricator Co. | 82, 83 | Phileo Corporation, Storage Battery Div. | 149 |
| Barco Manufacturing Co., Not Inc. | 105 | Holland Company | 148 | Phillips Screw Manufacturers | 138 |
| Beatty Machine & Mfg. Company | 152 | Houde Engineering Div. of Houdaille-Her- | 112 | Pilliod Company, The | 157 |
| Blanchard Bros. and Lane | 168 | shey Corporation | | Post Company, The Frederick | 140 |
| Broderick & Bascom Rope Co. | 35 | Hyatt Bearings Division, General Motors | 89 | Post-Glover Electric Company, The | 130 |
| Buffalo Forge Company | 58 | Corp. | | Protectoseal Company | 151 |
| Bullard Company | 36, 37 | Hycar Chemical Company | 124 | Pyle-National Company, The | 119 |
| C | | I | | R | |
| Carnegie-Illinois Steel Corporation | 78, 79 | Independent Pneumatic Tool Company | 56 | Racine Tool & Machine Co. | 156 |
| Chamberburg Engineering Company | 45 | Ingersoll-Rand Company | 51 | Reconstruction Finance Corp. | 171 |
| Champion Rivet Company, The | 170 | International Nickel Company, Inc., | 46, 98 | Republic Steel Corporation | 91 |
| Cherry Rivet Company | 40 | The | 170 | Ridge Tool Company, The | 160 |
| Chicago Metal Hose Corporation | 163 | Iron & Steel Products, Inc. | | Rockford Machine Tool Co. | 38 |
| Chiksan Company | 153 | | | | |
| Cincinnati Milling Machine Co. | 66 | | | | |
| Clark Company, Robert H. | 29 | | | | |
| Clark Equipment Company | 6 | | | | |
| Classified Advertisements | 152 | | | | |
| Climax-Molybdenum Company | 96 | | | | |
| Coffin, Jr., Company, The J. S. | 104 | | | | |
| Coffing Hoist Company | 167 | | | | |
| Columbia Steel Company | 78, 79 | | | | |
| Consolidated Machine Tool Corporation | 47 | | | | |
| Crane Co. | 94 | | | | |
| Cullen-Friededt Company | 162 | | | | |
| D | | J | | S | |
| Dampney Company of America, The | 77 | Johns-Manville | 86 | Safety Car Heating and Lighting Com- | 121 |
| Dayton Rubber Mfg. Company, The | 107 | Johnston Manufacturing Company | 166 | pany, Inc., The | 41 |
| Dearborn Chemical Company | 64 | Jones & Lamson Machine Company | 55 | Wm Sellers & Company | 154 |
| Diesel Engineering Company | 99 | Jones & Laughlin Steel Corporation | 118 | Sheldon Machine Co. | 165 |
| Dow Corning Corporation | 135 | Justrite Manufacturing Company | 168, 171 | Silent Hoist & Crane Co. | 80, 81 |
| Duff-Norton Manufacturing Co., The | 22 | | | Sinclair Refining Company, Railroad Sales | 155 |
| Durametallic Corporation | 162 | | | Snap-on Tools Corporation | 12 |
| E | | K | | Spicer Manufacturing Corporation | 143 |
| Eaton Manufacturing Company, Reliance | 137 | Kenametal, Inc. | 127 | Standard Car Truck Company | 128 |
| Div. | | Keybolt Appliance Division, Harding | | Standard Oil Co. of California | 92 |
| Edison Storage Battery Div., Thomas A. | 132 | Brothers, Inc. | 168 | Standard Oil Company (Indiana) | 75 |
| Edison, Inc. | 132 | Kiene Diesel Accessories, Inc. | 171 | Sullivan Machinery Company | 14 |
| Edna Brass Mfg. Co., The | 160 | King Machine Tool Company, The | 63 | Superior Railway Products Corp. | 106 |
| Editor's Desk | 62 | Koppers Company, American Hammered | | Symington-Gould Corporation, The | 131 |
| Electric Service Manufacturing Co. | 136 | Piston Ring Div. | 87 | | |
| Electric Storage Battery Company, The | 125 | Koppers Company, Wood Preserving Div. | 141 | | |
| Electro-Motive Division, General Motors | 68a, 68b | | | | |
| Electronic Laboratories, Inc. | 129 | | | | |
| Ex-Cell-O Corp. | 155 | | | | |
| F | | L | | T | |
| Fafnir Bearing Company | 114 | LeBlond Machine Tool Co., The R. K. | | Templeton, Kenly & Co. | 167 |
| Fairbanks, Morse & Co. | 116 | Back Cover | | Tennessee Coal, Iron & Railroad Com- | 78, 79 |
| Firth-Sterling Steel Company | 19 | Leslie Co. | 134 | Thomas Machine Manufacturing Co. | 169 |
| Fisher Furnace Company | 157 | Lima Locomotive Works, Incorporated | 67b | Timken Roller Bearing Company, The | 115 |
| Flannery Bolt Company | 101 | Lodge & Shipley Machine Tool Co., The | 50 | Tinnerman Products, Inc. | 11, 169 |
| Flexible Steel Lacing Company | 168 | Lucas Machine Tool Co., The | 60 | T-Z Railway Equipment Co. | 158 |
| Flexo Supply Company | 169 | Lufkin Rule Co. | 161 | | |
| Franklin Railway Supply Company, Inc. | 67a | | | | |
| | | M | | U | |
| | | MacLean-Fogg Lock Nut Company | 7 | H. B. Underwood Corp. | 167 |
| | | Mahr Manufacturing Co., Div. of Diamond | | Union Asbestos and Rubber Co. | 110, 111 |
| | | Iron Works, Inc. | 169 | Union Steel Castings Division of Blaw- | |
| | | Magnaflux Corporation | 34 | Knox Co. | 103 |
| | | Manganese Steel Forge Co. | 109 | Union Switch & Signal Co. | 72, 73 |
| | | Marchant Co., Geo. F. | 164 | Unit Truck Corporation | 2 |
| | | Mattison Machine Works | 52 | U. S. Metallic Packing Co., The | 166 |
| | | Maxim Silencer Co., The | 76 | United States Steel Corp. | 78, 79 |
| | | McGill Manufacturing Co., Inc. | 157 | United States Steel Export Company | 78, 79 |
| | | McKag-Hatch, Inc. | 166 | Universal Bearing Machine Company | 164 |
| | | McKay Company, The | 23 | | |
| | | Mines Equipment Company | 163 | | |
| | | Minneapolis-Honeywell Regulator Co. | 95 | | |
| | | Moline Tool Co. | 158 | | |
| | | Monroe Auto Equipment Co. | 123 | | |
| | | Motor Wheel Corporation | 167 | | |
| | | Murray Manufacturing Co., D. J. | | | |
| | | N | | V | |
| | | Nathan Manufacturing Co. | 9 | Viloco Railway Equipment Co. | 151 |
| | | National Bearing Metals Corporation | 150 | | |
| | | National Electric Coil Company | 139 | | |
| | | National Lead Company | 39 | | |
| | | National Malleable and Steel Castings Co. | 93 | | |
| | | National Tube Company | 78, 79 | | |
| | | W | | Y | |
| | | Walworth Company | 90 | | |
| | | Warner & Swasey Co. | 28 | | |
| | | Watson-Stillman Co., The | 13 | | |
| | | Waukesha Motor Company | 102 | | |
| | | Weatherhead Company, The | 147 | | |
| | | Wells, Martin | 27 | | |
| | | Westinghouse Air Brake Co. | 69 | | |
| | | Westinghouse Electric Corporation, | 4, 5, 144, 145 | | |
| | | Whiting Corporation | 54 | | |
| | | Wilkening Manufacturing Co. | 97 | | |
| | | Wilson, Inc., Thomas C. | 153 | | |
| | | Wine Railway Appliance Co., The | Front Cover | | |
| | | Wyandotte Chemicals Corporation | 48 | | |

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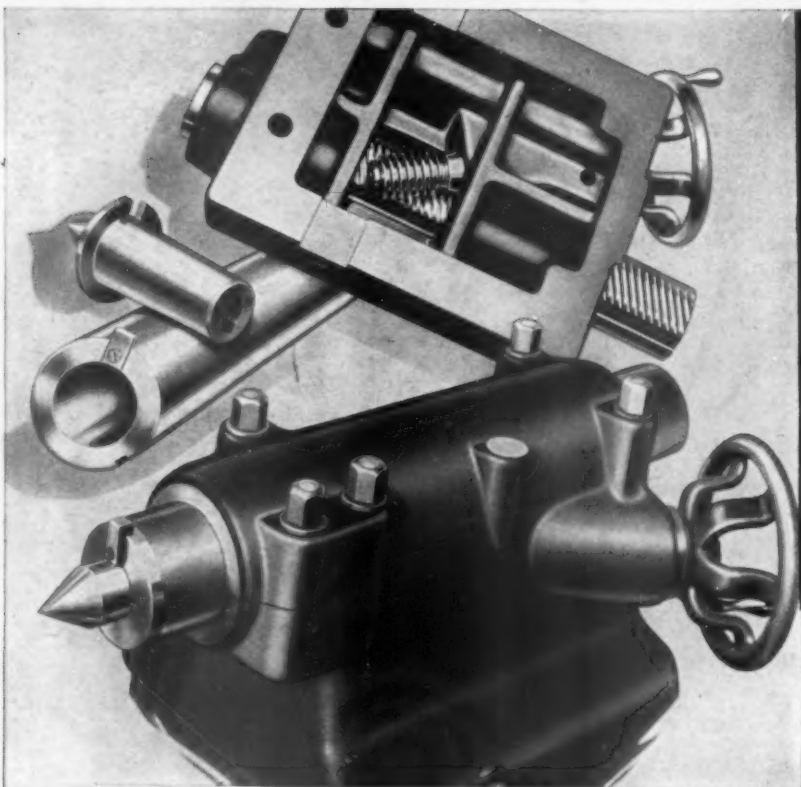
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